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being taken, the only way to affect the state of a system is by changing the flows.)

In the case of the semiconductor manufacturer, the leverage was to focus on the criteria that determined when orders needed credit approval, and to streamline the credit approval process itself. Upon further investigation, they discovered that 90% of the orders diverted for credit checks were approved, suggesting that more orders were being run through the credit office than was necessary. By changing the approval criteria on credit orders, they were able to reduce the flow into the "Orders on Credit Hold" accumulator and dramatically reduce the overall delay.

### "Collapsing" Accumulators

In general, we can think about reducing delays as a process of identifying and "collapsing" accumulators. For example, Toyota's Just-in-Time system removed the buffer inventory at each production step and thus converted a multi-stage, semi-coupled production process into one continuous flow system (see "Just-in-Time Flow System" on page 7). In essence, they eliminated all the accumulators in the process between production starts and finished inventory.

When trying to reduce delays in any process, you may want to follow these steps:

1. Map out your current process by identifying all the significant accumulators and flows.

2. Check for "hidden" accumulators by investigating the outflows of each accumulator to make sure that they balance with the inflows to the accumulator and the accumulator itself. (For example, if 10 cows flow into a pasture, but the total number of cows in the field at the end of the day is 2, the flow of cows back into the barn should be at least 8. If it is less than that, there must

be another outflow somewhere—like a hole in the fence!)

3. Explore why flows are being diverted to other accumulators. Could policies or processes be changed to reduce those flows?

4. Focus on the outflows from the "hidden" accumulators. Are there changes that could be made in policies or procedures to increase those flows?

### The End Result

Hidden accumulators may be chewing up valuable time and resources without

anyone being aware of them. By identifying and eliminating as many accumulators as possible, you can work toward creating a process where every stage is directly contributing to the value creation chain. ■

Daniel H. Kim is co-founder of the MIT Organizational Learning Center and of Pegasus Communications, Inc. He is a public speaker and teacher of systems thinking and organizational learning.

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THE GLOBAL CITIZEN

## A Systemic Look at Tax Reform

by Donella Meadows

*In the following editorial, Donella Meadows takes a systemic look at tax reform, exploring the far-reaching economic effects of three alternative tax plans, and the potential unexpected consequences of each.*

—Editor

There are four questions to ask about any new tax proposal.

Will it be simple? Will it be fair? Will it raise enough money for the government? Will it be good for the economy?

The flax tax that was promoted by U.S. presidential candidate Steve Forbes fails on all four counts. But, one could argue, so does our present tax system. Forbes' contribution was not his specific proposal, but his general call to rethink the tax system entirely.

People who are bold enough to do that are coming up with three alternatives—the flax tax, the VAT (value-added tax), and what, for mnemonic purposes, we might call the "splat" tax, to be levied on pollution and resource consumption. Let's look at all three proposals in terms of the four questions.

### Will It Be Simple?

At first glance, the proposed flat tax seems utterly simple. Seventeen percent off the top of earned income that exceeds \$36,800. No tax on interest, dividends, or capital gains. Complications will come, however, with the definition of "earned income." Surely we should subtract state and local tax payments. And the cost of the home office, interest payments on loans, adver-

tising, and medical insurance. We really should deduct charitable contributions. Even if the original proposal is clear-cut about those questions, tinkering will occur and we'll soon be back to Schedule C and Form XYZ.

A VAT is just a sales tax. If the feds got their money that way, as many states now do, the price of everything would go up by maybe 20%, but the process could be simple. Households would never have to think about the IRS again. Retail businesses would have to collect the tax, but most of them already do that for the states.

A splat tax would be complicated if it were applied to every smokestack and emission pipe in the country. The way to keep it simple would be to collect it at the point of resource input, not waste output. Tax coal, oil, gas, uranium, and metals at the well or mine. Tax trees where they're felled, ground water at the pump, fish at the port. We might want to put an extra tax on the more noxious forms of pollution, such as radiation, but the primary bite could come at the relatively few points where the economy sucks energy and materials from the Earth. Not simple, but way less complex than what we've got now.

### **Is It Fair?**

The unfairness of the flat tax will most probably be enough to kill it. Even if it's expanded to tax interest and dividends—not just wages—the law of diminishing returns tells us that taking away 17% of a low or even medium income does much more harm than taxing the same percentage of a high income. If we are to have an income tax at all, there are good economic reasons, as well as political ones, to make it progressive.

A VAT tax hits the poor much harder than the rich, unless there are exemptions for necessities and surcharges for luxuries. The same might be true of a splat tax, which would also cause prices to rise, but not uniformly.

Energy- and materials-intensive products, such as cars and computers, would go up more than labor-intensive services such as day care or massages. I don't think anyone knows how a pollution tax would distribute the tax burden, but it could, unless corrected, be unfair. Corrections for fairness put an end to simplicity with any kind of tax.

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***If you tax resource use and pollution, you encourage every ingenious idea for efficient resource use and you discourage pollution.***

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### **Will It Raise Enough Money?**

The proposed 17% flax tax would not bring in enough money to run the government, unless there are plans for enormous spending cuts that have not been specified. Raising a flat tax high enough to balance the budget would mean big middle-class tax increases.

The VAT, if it were hidden in the price of products (as in Europe) rather than added at the cash register, is nearly invisible. It would be relatively easy to raise without howls of outrage—good for budget balancing, bad if you're the type who wants a lot less government.

An energy/materials tax would also be unseen and hence less painful than a

check to the IRS. But it would be hard to set at the right level to fund the government. A tax of \$300 per ton on the carbon content of fossil fuels, for example (roughly equivalent to European gasoline taxes), would bring in \$360 billion a year at present fuel-use rates. But raising the price that much would encourage energy-efficiency measures that would decrease use and hence government income. Probably the only way to balance the budget would be a slow, steady increase in energy and materials taxes, say five percent per year, while reducing other taxes until they are no longer needed. The slow price rise would give users time to make the efficiency improvements that are the real point of this tax.

### **What Will It Do to the Economy?**

If you tax income, you discourage labor. If you tax capital gains, you discourage investment. (Every dollar of income or capital gains tax costs the economy 30 to 40 cents in reduced economic activity.) If you tax sales, you discourage consumption.

If you tax resource use and pollution, you encourage every ingenious idea for efficient resource use and you discourage pollution. You also correct one of the greatest faults of the market—the underpricing of nature. The flow of vital materials from the Earth, through the economy and back as waste to the Earth will never go to zero.

There will always be something to tax. Taxing resource use will just ensure that we use the stuff of the Earth with exquisite efficiency and for highly valued purposes. ●

*Donella Meadows is a system dynamicist and an adjunct professor of environmental studies at Dartmouth College. She is a MacArthur Fellow, and co-author of two best-selling books (The Limits to Growth and Beyond the Limits). She writes a weekly column for the Plainfield, NH Valley News.*