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an analytical approach

NEW TOOLS FOR SMART CSOs

IF WE ARE TO AVOID THE CATAclysmic EFFECTS OF ENVIRONMENTAL OVERSHOOT AND COLLAPSE, a larger and faster transition than anything *Homo sapiens* has ever done before is the only way out. But how exactly can we solve the problem? How can any one group make a difference?

This report advances the thesis that we can solve the sustainability problem the same way others have tackled *and solved* their own seemingly insurmountable challenges: by using the right tools. Accordingly, this report presents three key tools to allow the world's civil service organizations (CSOs) to work smarter rather than harder. The tools are:

- ✓ **Root cause analysis**
- ✓ **A process that fits the problem**
- ✓ **Model based problem solving**

The **Great Transition Initiative** is an international group working for a planetary civilization rooted in solidarity, sustainability, and human well-being.

The **Smart CSO Initiative** is a growing learning network of civil society organization (CSO) leaders, funders and researchers aiming to build effective CSO strategies for the 'Great Transition' to a sustainable society and economy.

Each of these tools has long been used by business and science to solve their own bleeding edge problems. This begs the question:

Why can't public interest activism do the same?

PREPARED ESPECIALLY FOR THE GREAT TRANSITION AND SMART CSOs INITIATIVES

OCTOBER 7, 2011

The Challenge

The latest Great Transitions Initiative (GTI) report is *Civil Society Organization: Time for Systemic Changes*.¹ Published in October 2011, it concluded that:

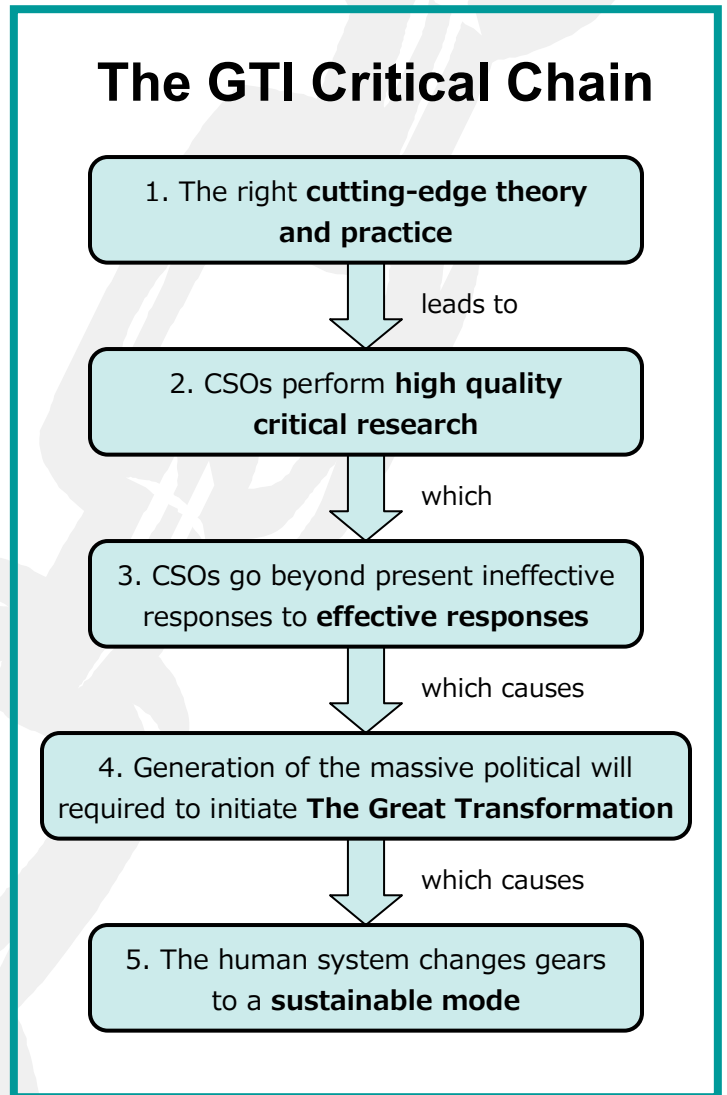
- More transformative approaches, **drawing on cutting-edge theory and practice**, are required for CSOs to fulfill their role of helping humanity meet contemporary challenges.
- The initiative will ...catalyze **critical research** on how CSOs **can more effectively** influence the social and political systems towards a Great Transition.
- Smart CSOs will encourage CSOs to move **beyond piecemeal and fragmentary responses** to developing strategies that align with a social and economic Great Transition. Ultimately the aim is to change the course of CSO strategies to contribute to mobilizing a global movement and **generating massive political will for deep change**.

The problem solving strategy

How exactly can we (1) draw on cutting-edge theory and practice so that (2) CSOs can perform the critical research necessary to (3) much more effectively go beyond present piecemeal and fragmentary responses in order to (4) generate the massive political will required to transform (5) the human system to a sustainable mode? That is an immense challenge.

Let's be clear on how this challenge is structured. The five steps in the above paragraph form the backbone of the GTI's phased strategic plan. This consists of a cause-and-effect critical chain with five main links, as shown. If each of the first four links is strong the plan will work to create the strong fifth link that humanity so desperately needs.

The key to it all lies in the need for "cutting-edge theory and practice" because that's what sets off the chain. It's the foundation of the entire strategy. Accordingly this report addresses the first link in the chain by introducing three new tools. These provide



the theory and practice that will allow the rest of the links in the chain to work as planned.

The three new tools are essential for performing high quality research on this type of problem, so much so that the problem cannot be solved without them. This appears to explain why the sustainability problem has defied solution for so long.

Let's examine each tool, one at a time.

Principle 1:

Difficult problems can be solved only by resolving their root causes.

The first new tool: root cause analysis

One of the most fundamental principles of all of science is: *Difficult problems can be solved only by resolving their root causes.* This is so critical to success you should memorize it and hang up a little sign in your head with the principle on it, until it becomes second nature or until The Great Transition is achieved.

Hanging up a sign can work. Thirty five years ago one of my college buddies started a life project. His vision was to build a 35 foot steel sailboat from scratch and sail it around the world. Like me, he was an engineer at Georgia Tech. He took a course in welding. He hired a naval architect to modify some plans. He moved into an old warehouse with space for the project. And so on. About a decade after he started he told me a little story. At the very beginning after he had committed, he hung up a little sign in his head that said "Do one thing on the boat every day." That kept him going and focused. (Did he finish? Of course.)

To explain the principle we need to clearly define two terms: difficult problem and root cause.

A **difficult problem** is one that has not yielded easily to solution or has characteristics making it

similar to other problems known to be difficult. The sustainability problem contains both features. Work on solving it began in earnest in the early 1970s with creation of numerous Environmental Protection Agencies, the Stockholm Conference, creation of the United Nations Environmental Programme, and publication of *The Limits to Growth*. Interestingly, in 1973 the Science Council of Canada said that "Canadians, as individuals, and their governments, institutions and industries, **[must] begin the transition** from a consumer society preoccupied with resource exploita-

tion to a conserver society engaged in more constructive endeavours."² Even then the need for the Great Transition was recognized.

But today, forty some years later, the problem remains unsolved with no credible solution in sight. The situation has become so dire that in 2006 James Hansen, NASA's top climate change expert, said "the world has a 10-year window of opportunity to take decisive action on global warming and avert catastrophe."³ Furthermore, climate change is only one of the top eleven problems listed in the 2000 SCOPE Study.⁴

The Top Eleven Environmental Problems

1. Climate change	51%
2. Freshwater scarcity	29%
3. Deforestation and desertification	28%
4. Freshwater pollution	28%
5. Loss of biodiversity	20%
6. Air pollution	20%
7. Soil deterioration	18%
8. Ecosystem functioning	17%
9. Chemical pollution	16%
10. Stratospheric ozone depletion	15%
11. Natural resource depletion	11%

Only one problem has been solved: the stratospheric ozone problem. The rest are growing exponentially worse with no credible solution in sight. Long term, all are as potentially devastating as climate change. The percents are the percentage of SCOPE study respondents who mentioned the issue.

The sustainability problem has all the characteristics typically found in incredibly hard to solve problems. It's endlessly complex. It's counter intuitive, since predictions about how the system will respond to solution efforts rarely play out as expected. It involves countless stakeholders, so diverse and distracted it's hard to get them to even focus on the problem and give it the priority it deserves. Above all, the problem is systemic. The entire human system, as well as its containing system, the biosphere, is involved in the causes of the problem.

How then are we to solve such an intractable problem? The only known way is by resolving its root causes.

Definition of root cause

Every effect has a cause. If we apply root cause analysis to a problem and trace its symptoms along their causal chains, eventually we can arrive at the root causes.

Most people have no clear definition for root cause. The result is the powerful tool of root cause analysis cannot be effectively applied.

According to Wikipedia a **root cause** is "an underlying cause that leads to an outcome or effect of interest. Commonly, 'root cause' is used to describe the earliest event in the causal chain where an intervention [a fundamental solution] could realistically have prevented the outcome."⁵ This is close but not quite good enough for high quality analysis. Too many earliest events could qualify, leading to a bewildering blizzard of root cause candidates. Instead, here's our definition, as refined over a period of ten years of research:⁶

A **root cause** is that portion of a system's structure that, using the checklist in the box, explains why the system's behavior produces the problem symptoms. Finding root causes is identical to diagnosing the deepest causes of an illness. If the causes are not treated successfully the illness will either not go away fully or it will return. Root causes are found by asking a succession of process driven "Why is this happening?" Kaizen-like questions until the root causes are found.

How do you know when you've found a root cause? The **Five Requirements of a Root Cause** are listed

below. This checklist allows numerous unproductive or pseudo root causes to be quickly eliminated.⁷

The Five Requirements of a Root Cause

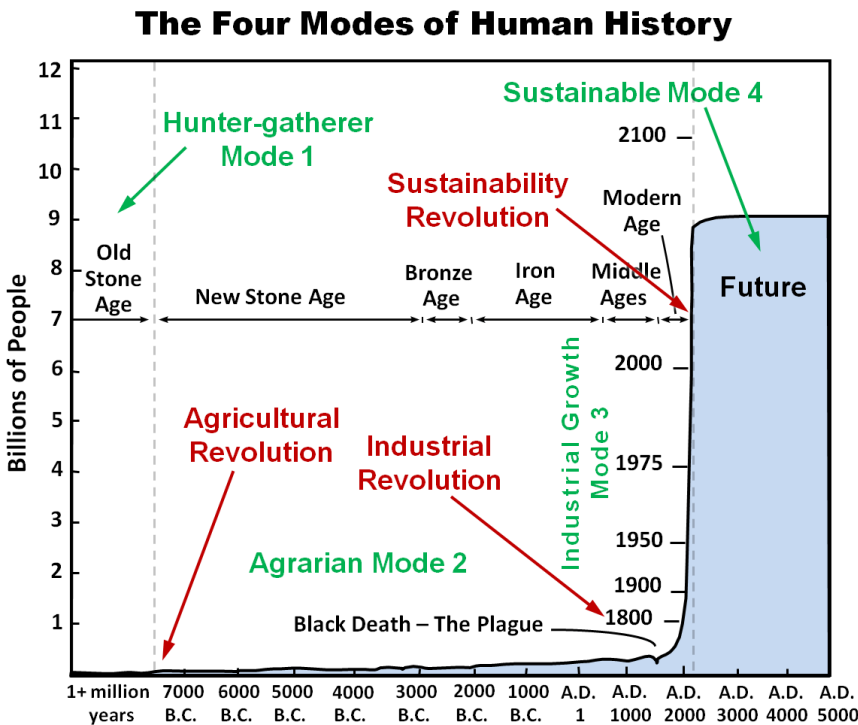
1. It is clearly a (or the) **major cause of symptoms**.
2. It has **no worthwhile deeper cause**. This allows you to stop asking why at some appropriate point in root cause analysis. Otherwise you may find yourself digging to the other side of the planet.
3. **It can be resolved**. Sometimes it's useful to emphasize unchangeable root causes in your model for greater understanding and to avoid trying to resolve them without realizing it. These have only the first two requirements.
4. Its resolution will not create other equal or bigger problems. **Side effects** must be considered.
5. **There is no better root cause**. All alternatives have been considered.

The important thing is to not stop at intermediate causes, as activists are doing today. An **intermediate cause** is midway on the causal chain between a root cause and problem symptoms. They are plausible and easily found. Working on resolving what are in fact intermediate causes *looks* productive and *feels* productive. Intermediate cause solutions, more accurately called symptomatic solutions, may even work for awhile. But until the true root causes are resolved powerful social agents will invariably find a way to delay, circumvent, block, weaken, or even rollback these solutions, because intermediate causes are symptoms of deeper causes. Or solution inefficiencies or other system behaviors due to unresolved root causes will take their toll. One must strike at the root.

Historic mode changes from the perspective of root cause resolution

That difficult problems can be solved only by resolving their root causes has been proven by the great turns of history. Each was a large systemic mode change precipitated by resolution of a major root cause. The largest are shown in the graph below.

What problem did invention of agriculture solve? The lack of a reliable source of food problem. What was the root cause? *Total dependency* on nature for providing



Graph source: Pop. Reference Bureau and UN, *World Pop. Projections to 2100* (1998). Modified by Thwink.org to show modes, revolutions, and pop. leveling out at 9B not 11B.

an ample supply of food. This was resolved by changing to *partial dependency* via raising crops and domesticating animals. This caused the **Agricultural Revolution**, which shifted the system from the **Hunter-gatherer Mode** to the **Agrarian Mode**.

Here's a mode change not on the graph: What problem did invention of modern democracy solve? The autocratic ruler problem, which caused those at the top to benefit greatly at the expense of everyone else. Its root cause was *no balancing feedback loop* between a nation's ruler(s) and its people. Once that root cause was resolved everything changed. Until then, no

amount of system tweaking or rebellion to change the ruler or soften his policies solved the problem for long.

Returning to the graph, the most influential mode change in the last ten thousand years was the **Industrial Revolution**. The problem was humanity had long been stuck in the Malthusian Trap and thus languished in the Agrarian Mode.⁸ As first described by Thomas Malthus in 1798 in *An Essay on the Principle of Population*, a region's population will grow until checked by war, famine, or disease. A long stream of new techno-

logical inventions have each raised living standards for awhile, such as invention of agriculture, fire, iron, the wheel, and the plow. But then population rises since there is more food per person and thus lower mortality rates. The population grows until food per person falls right back to a subsistence level. Throughout history mankind was never able to escape the Malthusian Trap for long.

That ended abruptly with the Industrial Revolution around 1800. The root cause of the Malthusian Trap was that technological invention could not stay ahead of population adjustment to more food, better sanitation, less warfare, and so on. The root cause was resolved by invention of a highly efficient, easily replicated method of mass production. This depended on a critical mass of factors like work ethics, universal power such as steam then and electricity now, access to raw materials, and political stability. The

most important factors were less obvious: a sufficiently mature system of private property rights and a sufficiently efficient managing agent: the modern corporation. These factors were most present in England, birthplace of the Industrial Revolution. All that was missing was a triggering event, which came in the form of invention of the first efficient steam engine in 1763.

The miracle of the Industrial Revolution is that it broke the iron grip of the Malthusian Trap forever (or so it seemed to most). Population and quality of life soared, as the system entered the **Industrial Growth mode**.⁹ But we now know this historic mode change was only

temporary. All the Industrial Revolution did was raise the limits so fast and with such hidden delays in environmental impact that it created the need for the next mode change. This will be The Great Transition, also known as the **Sustainability Revolution**.

The universal causal chain

Every effect has a cause. The chain of cause and effect always leads from **root cause** to **intermediate cause** to **problem symptoms** as diagrammed. This is how all causal chains work.

In difficult problems the root causes are so hard to find that people fall into the practice of trying to resolve intermediate causes instead. This is done with what are in fact **symptomatic solutions**. Since these cannot possibly resolve the root causes, only low leverage is possible. Low leverage solutions seldom work because

activists are usually a minority with much less power over the system than its dominant social agents. Activists must therefore switch to high leverage solutions.

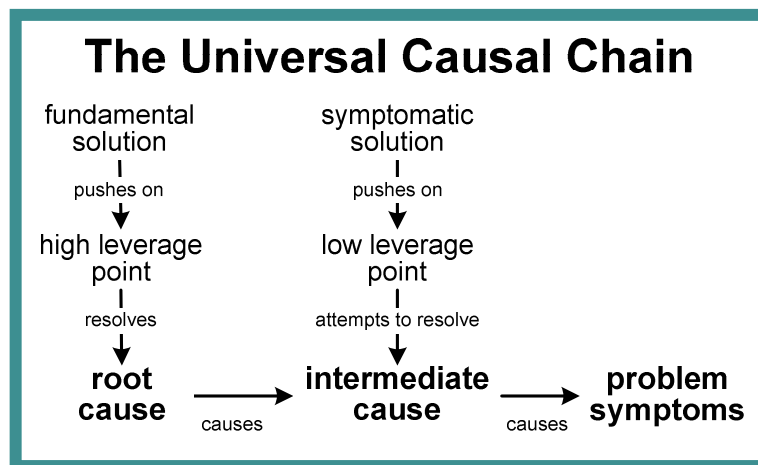
This can be done with root cause analysis. First the root causes are found. Then the high leverage points for resolving them are identified. Finally, **fundamental solutions** are designed and tested for pushing on the high leverage points.

For example, Thomas Paine's *Common Sense*, a small pamphlet of 46 pages published in early 1776, pushed on the high leverage point of pointing out that the colonies had no need of England as ruler and protector. They could do that themselves. Before *Common Sense*, the concept of independence was considered impossible. But once the pamphlet was published, a Bostonian wrote that "Independence a year ago could not have been publicly [sic] mentioned with impunity ... Nothing else is now talked of, and I know not what can be done by Great Britain to prevent it." ¹⁰ The high leverage point resolved the root cause of no balancing

feedback loop between a nation's ruler(s) and its people because of Paine's novel analysis/solution: ¹¹

Common Sense was like nothing published before. Paine did not simply protest British policies and taxes. **He completely recast the conflict.** For a start, he directly connected the king to the British government's criminal and murderous actions. Yet he made clear that the problem was not the current king or government but **the very structure** and character of Britain's political and social order.

Paine **called upon Americans** to make a true revolution of their struggles. Ignoring Rush's warning, he clearly spelled out both independence and republicanism. Moreover, he radically articulated the ideal of self-government....



Note how Paine "called upon Americans" to change "the very structure" of the system. Root causes of systemic problems are always systemic, so they can only be resolved by changing the structure of the system. That is exactly what must be done with the sustainability problem.

CSO's: Time for Systemic Strategies says "CSOs need to **fundamentally recast their strategies** to play a vital role in enabling such an encompassing movement. This will require CSOs to embrace a broad, unifying vision for a sustainable future and **actions that address root causes** ...rather than the symptoms. On that basis, CSOs need to **rethink and redesign the ways they work** and try to influence the political, social and human systems towards sustainability."

The first tool, root cause analysis, allows smart CSOs to take "actions that address root causes." The second tool deals with "CSOs need to fundamentally recast their strategies" by providing a problem solving process that fits the problem CSOs are trying to solve.

Principle 2:

The more difficult the problem, the better the process used to solve it must be.

The second new tool: A process that fits the problem

Exactly how are CSOs going “to fundamentally recast their strategies?” Thomas Paine recast the strategies of a nation by painting an alternative that had never been clearly and persuasively articulated before. This report and further material at Thwink.org modestly hopes to help do the same for CSOs.

CSO’s: Time for Systemic Strategies says that “Leveraging CSO’s Full Potential” can be done with a list of six new ways to work:

1. A new vision (for a sustainable future)
2. Embedding systems thinking into CSO practice
3. Developing a new narrative
4. Supporting the seeds of the new system
5. Supporting a new global movement
6. Engaging funders in systemic CSO strategies

The tool of a process that fits the problem falls into item two, which says:

Since neither traditional issue by issue approaches or linear cause and effect analysis are adequate, deep systemic change is needed to tackle interconnected sustainability issues. It is therefore essential for success that CSOs embrace **systems thinking** as the basis for understanding the world and creating viable strategies. A variety of **tools and frameworks** are available to CSOs for helping them to examine **system structures** and act **systemically**....

Exactly how are CSOs going to “examine system structures and act systemically” using the right “tools and frameworks?” That’s what the second tool is for.

Earlier we said that “Root causes are found by asking a succession of **process driven** ‘Why is this happening?’ Kaizen-like questions until the root causes are found.” A high quality way to systematically ask those questions leads to the principle that: *The more difficult the problem, the better the process used to solve it must be.* A shorter version is: *The process must fit the problem.*

A **process** is a reusable series of steps to achieve a goal. There’s the process of long division, the process of building a house, the process of raising a family or growing a field of wheat, and the process a nation’s constitution provides for running its government. Processes are everywhere. They rule our lives because we run our lives with them. Without the right millions of processes used every day, modern civilization would shudder and collapse back into the Dark Ages.

Doctors use a simple process of diagnosis first, treatment second. Business uses the process of double entry accounting as the foundation for achieving profit goals. Business also uses countless other processes, like annual planning, a hierarchy of control, and how to run a marketing campaign. Science bases its work on the Scientific Method, a process for determining if a hypothesis is (probably) true or false.

But when we examine the field of public interest activism, what do we find? No standard formal process whatsoever. Instead, we see well intentioned individuals and CSOs putting forth one solution after another that have tremendous intuitive appeal. They are plausible. They *should* work. But in practice they seldom do on difficult problems. WHY is this?

It's because intuitively derived solutions rarely resolve root causes. In difficult problems root causes are very hard to find, especially multiple root causes. Long analysis, careful verification of all key hypotheses, exacting experimentation and measurement, detailed modeling, and so on is required. It's not at all obvious how to do this efficiently and effectively. That's why a formally defined process is required. *CSO's: Time for Systemic Strategies* senses this when it says "It is therefore essential for success that CSOs embrace... tools and frameworks [for] CSOs for helping them to examine system structures and act systemically."

Here's how the work at Thwink.org can help:

Over the past ten years Thwink.org has developed a process that can serve as an example of a suitable process for environmentalists. This is the **System Improvement Process** (SIP). It was designed from scratch to solve difficult social problems. SIP contains a total of 23 steps as summarized in the diagram below. ¹²

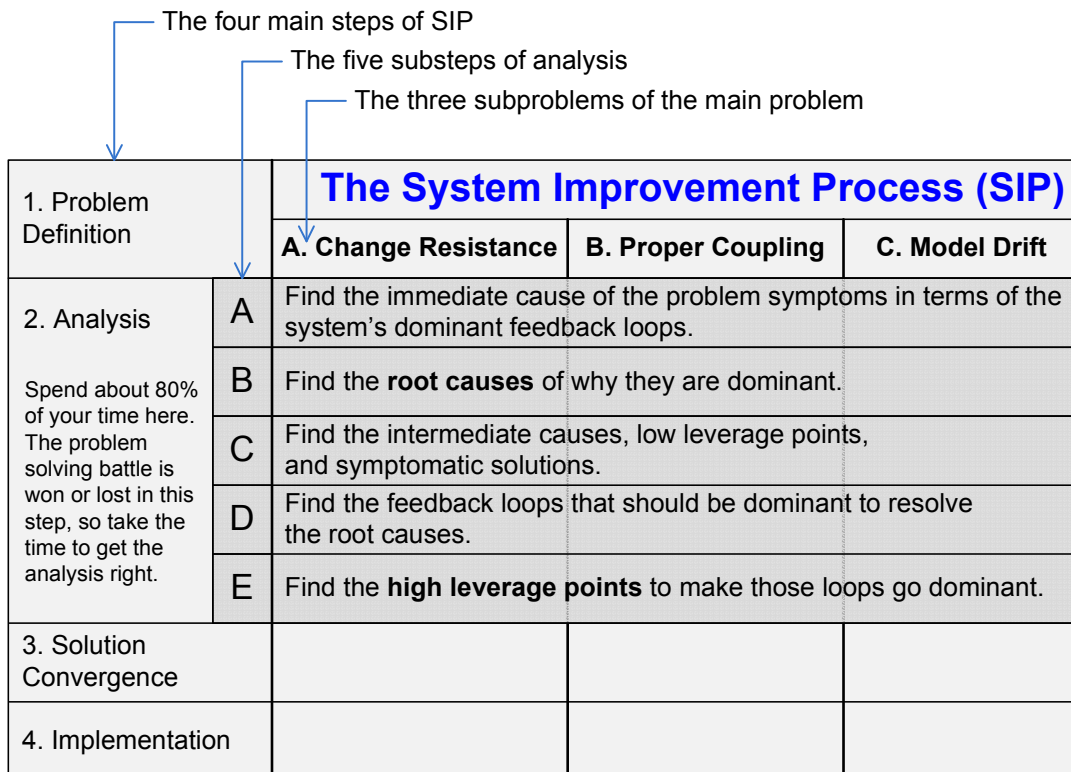
Briefly, here's how the process works. SIP first defines the overall problem. Then it breaks the one big problem down into the **three subproblems** present in all difficult social problems:

- A. How to overcome change resistance.
- B. How to achieve proper coupling.
- C. How to avoid excessive model drift.

Change resistance is the tendency for a system to continue its current behavior, despite the application of force to change that behavior. When someone proposes a serious solution that will help and the system rejects it that's change resistance.

Once you know what change resistance is, it's everywhere. It's the reason thousands of perfectly workable solutions have been rejected for decades. It's the reason the U.S. Senate voted an astounding 95 to zero against signing the Kyoto Protocol in 1999, despite a democratic President and a strongly pro-environmental Vice-President, Al Gore, at the time. Change resistance is the reason that in *Great Transition: The Promise and Lure of the Times Ahead*, 2002, on page 41 we find: ¹³

To gain ascendancy, the *Policy Reform* vision must **overcome the resistance of special interests**, the myopia of narrow outlooks and the inertia of complacency.



Proper coupling occurs when the behavior of one system affects the behavior of one or more other systems in a desirable manner, using the appropriate feedback loops, so the systems work together in harmony in accordance with design objectives. For example, if you never got hungry you would starve to death. You would be improperly coupled to the world around you. In the environmental sustainability problem the human system is improperly coupled to the greater system it lives within: the environment. Most popular solutions (such as the Kyoto Protocol, conservation, and population control) are proper coupling solutions since the proper coupling problem is commonly seen as *the* problem to solve.

Model drift occurs when situations appear that a solution model cannot handle and the model cannot be

imposing suite of problems that can overwhelm a society's capacity to solve them simultaneously.

All three subproblems must be solved for a problem to be completely and permanently solved. *In difficult social problems, change resistance is the crux.* It must be solved first because until change resistance is overcome proper coupling is impossible.¹⁴

This is an important insight that once fully accepted will have deep ramifications. Examine the list of six new ways to work in *CSO's: Time for Systemic Strategies* as listed on page 7. Except for items 2 and 6, which have the potential for promoting a process that fits the problem, none of the items on the list can possibly have more than a small effect, because they do nothing to overcome the crux of the problem: change resistance. This implies a refocus in subsequent

The most important step in the process is
finding the root causes.

This makes or breaks the entire result.

patched up to accommodate them. If these anomalies are relatively small, the model is still useful and model drift is said to have occurred. But if the exceptions accumulate and become major, then the model is now a hindrance to those using it. Excessive model drift has occurred and the model is broken. It's so useless the solution no longer works as originally intended. This may or may not be noticed by some or even the majority of model users, who often erroneously claim the present model still works.

So many solutions are in model drift in most nations that they are in a continual state of crisis management, because previously solved problems keep reappearing. For example, most nations have never fully solved the cyclic recession problem, the political corruption problem, the institutional poverty problem, and the excessive disparity in income/wealth problem. Add the environmental sustainability problem and you have an

planning documents for the Great Transition and the Smart CSOs Initiative.

Let's keep going on our quick description of SIP. Once the one big problem is decomposed into three or more subproblems, **root cause analysis** is employed to find the root causes. *This is the most important step in the process.* Get it right and the problem is mostly solved. Get it wrong and no amount of ingenious solutions, heroic effort, or inspirational prose will solve the problem because difficult problems can be solved only by resolving their root causes. That's why you should spend about 80% of your time in analysis. A company's products are no better than its R&D. An NGO's solutions are no better than its analysis.

Only after the root causes are found does attention shift to solution development. But even then, analysis continues. The model used to find the root causes is

used to find the intermediate causes, the low leverage points, and the symptomatic solutions activists have been using in a vain attempt to resolve the intermediate causes. This is crucial since part of the solution is to stop such wasteful effort.

Once the analysis step is reasonably complete, **solution convergence** begins. Here the collection of solution elements for solving the problem are converged upon by generating candidate solution elements and testing them against specific high leverage points. This goes relatively quickly because how the system behaves is so well known. This step includes further modeling, experimentation, and pilot testing in order to refine the solution elements to ones that can be proven to work.

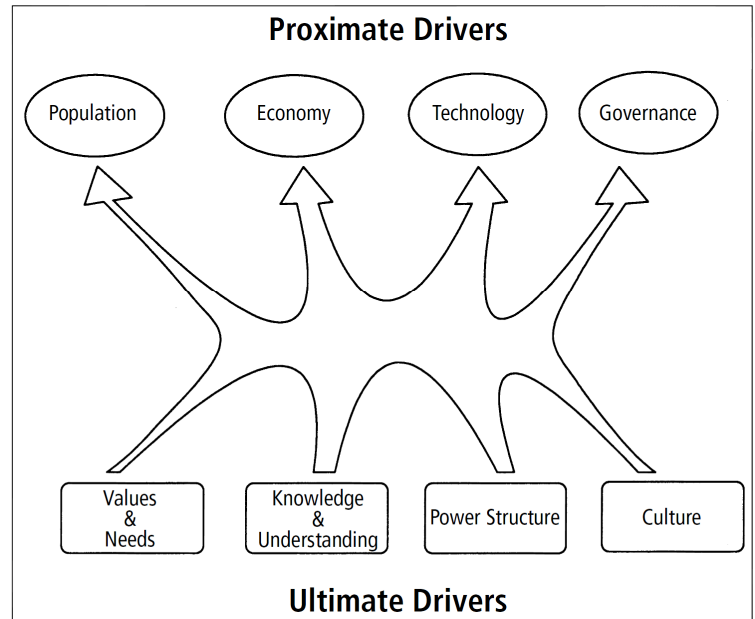
There is no such thing as a simple analysis or a simple solution to a complex problem. For a detailed description of SIP, the analysis, and sample solution elements see *Common Property Rights: A Process Driven Approach to Solving the Complete Sustainability Problem* at Thwink.org. The book presents twelve sample solution elements. All are required to solve the *complete* sustainability problem.

The final step of SIP is **implementation**. We're dealing with public interest problems here, so at this point problem solvers hand off their analysis, solution convergence work, and final recommended solution elements to government or an appropriate institution. Because a high quality root cause analysis has been done and solution elements are well tested, what is usually the hardest step, implementation, now becomes the easiest.

Comparison of SIP to the analysis used in *Great Transition*

Below is from page 50 of *Great Transition*, 2002:

Figure 9. Proximate and Ultimate Drivers



This is a strong start along the lines of root cause analysis. Proximate drivers are intermediate causes. Ultimate drivers are root causes. But how correct and complete are the conclusions? Reading the text, the exact causal chains and root causes are never identified, probably because no formal process that fit the problem was employed. Because of that no credible solution policy recommendations can be discussed or made. This is normal. It's the situation for all environmental organizations I've examined, including the UNEP and the EU Environmental DG. None use a process that fits the problem or root cause analysis of the complete problem.

Now imagine how things would change if something like SIP was used instead. Instead of diagrams like the one above and conclusions like "The prospects for a Great Transition depend on the adaptations of all institutions—government, labor, business, education, media and civil society." (page 50) where how that can be done is never analytically explained, we would see something like the analysis shown on the next page.

The *Summary of Analysis Results* represents the future of environmentalism. This is a rigorous, complete, process driven root cause analysis of the entire sustainability problem. Mature approaches like this are standard in large successful business and science organizations. It's a matter of time before the same tools and attitudes make their way into the hands of suddenly smarter CSOs.

The *Summary of Analysis Results* is the highlight of *Common Property Rights: A Process Driven Approach to Solving the Complete Sustainability Problem*. The

table summarizes the analysis presented in the book. The two gray rows contain the key output of the analysis: the root causes and the high leverage points for resolving them.

The Solution Convergence row contains twelve sample solutions elements. Because each is designed to push on a high leverage point in order to resolve a specific root cause, we have high solution accuracy. Each solution element is like a rifle shot fired up close at a known target. The root cause is the bullseye.

Compare the quality of these twelve solutions to the solutions commonly promoted by CSOs or governments working on the sustainability problem. There's a world of difference in which are more likely to work because popular solutions are rarely designed to resolve specific root causes.

Smart CSOs will have little trouble assimilating the new tools of root cause analysis and a process that fits the problem. The tools are surprisingly simple once understood. They are the same tools used by millions of scientists and business employees, so there's a wealth of material on how to use them. However, these tools have not been applied to difficult social problems before. That's why we had to create SIP, do a sample first iteration application of the process, and write it up.

We've explained how a process that fits the problem can work. But how do we go deep in the analysis to know with clarity how the system works? How can we actually see the structure of the social system in convincing detail? How can we rapidly test our key assumptions as we go, no matter how complex they become? For that we need another tool.

Summary of Analysis Results of Executing SIP on the Global Environmental Sustainability Problem						
1. Problem Definition		How to achieve global environmental sustainability in terms of the desired system goal state				
2. Analysis	Subproblems	A. How to Overcome Change Resistance	B. How to Achieve Social Proper Coupling	C. How to Avoid Excessive Model Drift	D. How to Achieve Economic Proper Coupling	
	A	Subproblem symptoms	Successful opposition to passing proposed laws for solving the problem	Large for-profit corporations are dominating political decision making destructively	Failure to correct failing solutions when they first start failing	The economic system is causing unsustainable environmental impact
		Improperly coupled systems	Not applicable	Corporate and human life forms	Not applicable	Economic and environment systems
		Analysis model	Basic Dueling Loops of the Political Powerplace	Complete Dueling Loops model. This adds the Alignment Growth loop.		The World's Property Management System
		Immediate cause dominant loops	The Race to the Bottom among Politicians		Intelligent Adaptation loop in evolutionary algorithm model	Growth of Industrial Technology and Limits to Growth (the IPAT factors)
	B. Root cause of why those loops are dominant	High political deception effectiveness	Mutually exclusive goals between top two social life forms, <i>Corporatis profitis & Homo sapiens</i>	Low quality of political decisions	High transaction costs for managing common property sustainably	
	C	Intermediate causes	The universal fallacious paradigm, primarily Growth Is Good	Disagreement from corporate proxies on what to do	Laws giving corporations advantages over people	Externalized costs of environmental impact
		Low leverage points	More of the truth: identify it, promote it, magnify it	Logical and emotional appeals and bargaining	Trying to directly reverse laws that favor corporations	Internalize costs
		Symptomatic solutions	Technical research, environmental magazines and articles, awareness campaigns, marches, sit-ins, lawsuits, lobbying, etc.	Corporate social responsibility appeals, green investment funds, NGO/corporate alliances, etc.	Media use, campaigns, lobbying to get old laws repealed	Two main groups of solutions: prescriptive regulation and market-based
	D. Loops that should be dominant to resolve root cause	You Can't Fool All of the People All of the Time	Alignment Growth		Growth of Sustainable Technology and Impact Reduction	
	E. High leverage point to make those loops go dominant	General ability to detect political deception	Correctness of goals for artificial life forms	Maturity of the political decision making process	Allow firms to appear to lower transaction costs	
	3. Solution Convergence		Nine solution elements	Corporation 2.0, <i>Corporatis publicus</i>	Politician Decision Ratings	Common Property Rights
4. Implementation		Not yet ready for implementation because process execution is incomplete.				

Principle 3:

Difficult social problems are too complex to solve without a glass box model.

The third new tool: model based problem solving

The section on *Embedding systems thinking into CSO practice* in *CSO's: Time for Systemic Strategies* says:

Adequately addressing daunting global problems, like climate change, requires understanding the **complex feedback loops** within the wider system of which they are a part.

This can be done by using an appropriate modeling tool as part of the practice of model based problem solving.

If you look back at the SIP diagram on page 8 you'll see feedback loops mentioned several times. In fact, all five substeps of analysis depend on study of the system's feedback loops. This is best done by use of a simulation model, which means SIP depends on model based problem solving.

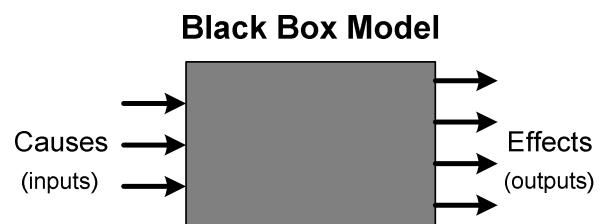
A **model** is a simplified representation of reality. A **simulation model** takes that representation and allows you to run the model so you can see how the system behaves over time. This is extremely useful for predicting how the system will respond to various forces, such as deep underlying trends, growth constraints, unexpected events, and solution policies. Simulation models are so vital for understanding the behavior of complex systems that their use is the norm in science and business. Examples are weather prediction models, climate change models, quantum physics models, and economic models.

The sustainability problem is primarily a social problem. It's unsound social behavior that's causing the problem. Yet when we examine the work of environmental organizations, from tiny ones all the way up to big ones like the Sierra Club, the World Wildlife Fund, the UNEP, and the EU Environmental DG, what kinds of simulation

models of the *social side* of the sustainability problem do we find? None. There are models but they focus on the *technical side* of the problem, such as climate change models, ecological system models, and the World3 model of *The Limits to Growth*.

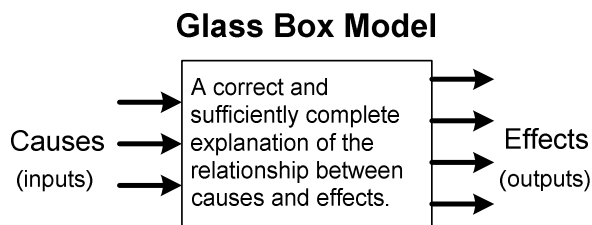
SIP was designed to solve difficult social problems. It uses simulation modeling to perform the analysis step. Difficult social system problems are so complex and counter intuitive they cannot be correctly understood without simulation modeling, just as so many other fields cannot understand their problems without modeling.

A simulation model provides a "glass box model" of the problem. Once you have one you can "see" inside the system. The "black box" around the system becomes transparent and turns into a "glass box." It's like looking inside a transparent fish to see how it works.



There's a huge difference between black box and glass box models. A **black box** is one you can't see inside of. A **black box model** of a system knows only the relationship between causes and effects (inputs and outputs). For example, society has long known you must eat to survive. But until modern anatomy and biology explained how food provided the nutrients and energy needed by the body and how these processes worked, no one knew why we had to eat to survive. Or they had shallow intuitively derived theories that were wrong.

What modern anatomy and biology provided was a **glass box model**, which allows you to clearly and correctly see why cause and effect occurs. For example, after Newton discovered gravity and the mathematical laws governing the movement of bodies, astronomers had a glass box model of the universe. They could now accurately predict where heavenly bodies would be in the future (the effect) given their present location, speed, and other bodies whose presence affected them (the cause). A glass box model provides a correct and sufficiently complete explanation of the relationship between causes and effects.



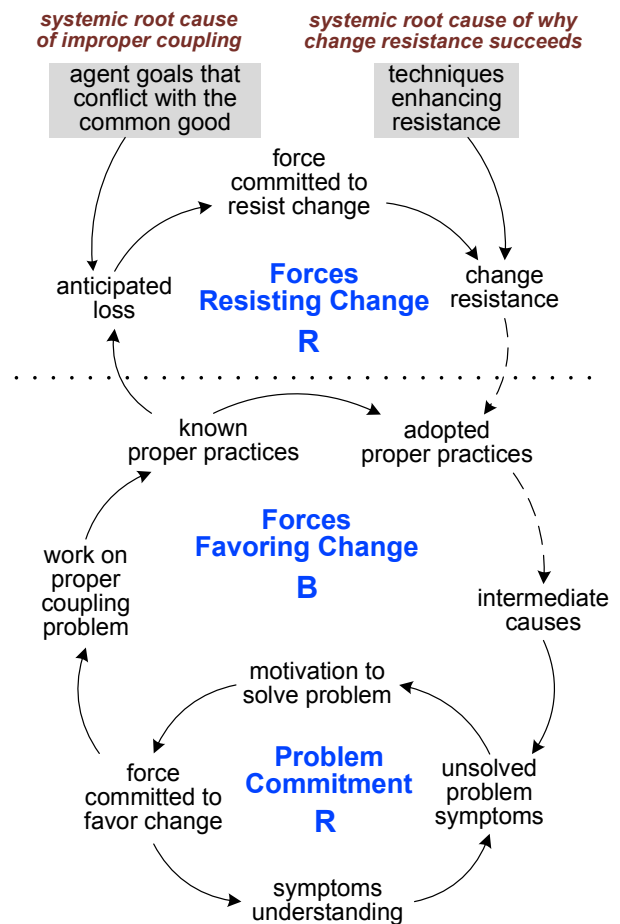
Traditional activism has used a black box model approach exclusively. The causes are the many factors that somehow cause a problem. The effects are the problem symptoms. When solutions are attempted the causes are changed to include solution efforts, which are designed to change the effects. Due to lack of a glass box model of the problem, a rather large amount of guessing has occurred about what's inside the black box. This has led to one intuitively derived solution after another. None have worked.

That can change if smart CSOs switch to model based problem solving. An example of how this tool can be applied is shown in the causal loop diagram. This is the high level model for a more complex simulation model. The model is from *Change Resistance as the Crux of the Environmental Sustainability Problem*.¹⁵

Change resistance is represented by the top loop, the **Forces Resisting Change**. Due to lack of model based problem solving, CSOs are working blind. They cannot clearly see anything above the dotted line. All they can see is the **Forces Favoring Change** loop, which is themselves and their allies, and the **Problem Commitment** loop. Because they can't clearly see the top loop they cannot rationally solve the problem.

If smart CSOs built a glass box model, however, they could see the top loop. That would allow them to drill down and find the root causes of systemic change resistance. Next they could find the high leverage points for resolving the root causes. Then they could develop solutions that would have a high probability of working, just as their peers in science and business have been doing so well for so long.

Causal Loop Diagram of the Process of Classic Activism



The key to solving a difficult social system problem is deeply and correctly understanding its relevant feedback loops. Modelers have a proverb that encapsulates the heart of their *modus operandi*: *If you don't understand a system's key feedback loops, then you don't understand the system.*

Conclusions

Page 50 of *Great Transition* says “The challenge is to develop appropriate methodologies, train a new cadre of sustainability professionals and build institutional capacity.” In this report we have tried to meet that challenge by providing the key tools needed. These tools have worked spectacularly well for others, so they should work equally well for smart CSOs. This will perhaps help to “catalyze critical research on how CSOs can more effectively influence the social and political systems towards a Great Transition.” (page 5 of *CSOs: Time for Systemic Strategies*)

Great transitions need great tools.

Endnotes

¹ *Civil Society Organization: Time for Systemic Changes, October 2011*, is available at http://www.gtinitiative.org/documents/IssuePerspectives/GTI-Perspectives-Civil_Society_Organizations.pdf.

² Source of quote about “Canadians... [must] begin the transition”: An Environment and Sustainability Chronology at http://www.sustreport.org/resource/es_timeline.htm.

³ The James Hansen quote is from *Warming expert: only decade left to act in time*, MSNBC at http://www.msnbc.msn.com/id/14834318/ns/us_news-environment/t/warming-expert-only-decade-left-act-time.

⁴ The SCOPE Study is summarized in *Global Environmental Outlook 2000*, available at <http://www.unep.org/geo2000>. This contains the Scientific Committee on Problems of the Environment (SCOPE) study on page 339. Some issues on the list are social, such as “poor governance.” Others are contributors (proximate causes) to other issues, such as “population growth and movement.” Extraneous issues like these were removed so as to leave only bona fide environmental problems. The top eleven problems are listed in the box on page 3. This list defines the *complete* global environmental sustainability problem in terms of symptoms.

More than 200 environmental experts in over 50 countries contributed to the study. 51% of all respondents mentioned climate change as a major emerging issue.

⁵ This definition of root cause is no longer found in the Wikipedia entry for root cause due to continual entry churn.

⁶ The definition of root cause is quoted from *Common Property Rights: A Process Driven Approach to Solving the Complete Sustainability Problem*, available at Thwink.org.

⁷ The first three characteristics of a root cause come from *Change Resistance as the Crux of the Environmental Sustainability Problem*, by Jack Harich, System Dynamics Review, 2010. Available at Thwink.org. The additional characteristics were added while writing the *Common Property Rights* book.

⁸ For an excellent treatment of the Malthusian Trap, see *A Farewell to Alms: A Brief Economic History of the World*, by Gregory Clark, 2007. Part One is *The Malthusian Trap: Economic Life to 1800*.

⁹ The Four Modes of Human History graph is from the *Common Property Rights* book mentioned above.

¹⁰ Quote from *Thomas Paine: A Political Life*, by John Keane, 1995, page 113.

¹¹ The extract about how Paine pushed on the high leverage point is from *Thomas Paine and the Promise of America*, by Harvey Kaye, 2005, page 43.

¹² For a full description of SIP see the *Common Property Rights* book.

¹³ *Great Transition: The Promise and Lure of the Times Ahead*, 2002 is available at <http://www.gtinitiative.org/resources/gtessay.html>.

¹⁴ For a detailed treatment of why change resistance is the crux and an analysis of the change resistance subproblem, see *Change Resistance as the Crux of the Environmental Sustainability Problem* at Thwink.org.

¹⁵ *Change Resistance as the Crux of the Environmental Sustainability Problem* is available at Thwink.org.