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Systemic economic instruments for energy security and global security

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Abstract. Energy security, climate stability, sustainable development, economic growth and national security are codependent goals; all will be achieved or none. This global security goal-set will remain elusive with prevailing 'patchwork' policy-making. Irreversible failure with one or more of the goals may be avoidable with a non-reductionist approach to global complexity, using systems thinking and systemic interventions at leverage points, of which two are proposed. Weapons spending could be deducted from Gross Domestic Product to define a 'Gross Peaceful Product' with which nations could align goals for growth and security. Other global security goals could be approached by a preventive insurance scheme. Significant producers would pay an obligatory premium on products (including fuels) according to the risk that they become waste in the air, land or water. Premiums would be invested in the capacity of nature, industry and society to reduce that risk. This market-based 'precycling insurance' would make mandatory emissions limits (and many other prescriptive interventions) redundant.

Keywords: codependence; systems thinking; leverage points; innovation; backcasting; prevention; market-based instrument; patchwork; policy; Gross Peaceful Product; precycling; precycling insurance; energy security; global security; climate; sustainable development; economic growth; circular economics; conflict; weapons.



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1. A global security goal-set

1.1. CODEPENDENT GOALS

The narrow view of 'energy security', of a nation securing enough energy, has in the past been achievable as a largely freestanding issue. In future no nation can be assured of energy security without successfully navigating a broader view of global security which encompasses sustainable development, economic growth, national security and climate stability. Securing enough energy has become codependent upon securing a set of other goals, including goals which appear to be in conflict with each other. If that is not challenging enough, none of these goals will be achievable anywhere without effective global collaboration.

The codependence of the above goal-set can be illustrated by considering any subset of the goals. What if one of the global security goals cannot be met? Failure to achieve energy security means the lights go out, with rapidly escalating impacts on societal sustainability and economic growth. Failure with sustainable development means that trends in wealth inequality, loss of nature and energy demand for example, are not reversed, making national security, energy security and climate stability unachievable. Failure with economic growth means global recession, which is incompatible with the large investments now needed for sustainable development and climate stability. Failure with national security means, at best, absence of the global co-operation needed to advance all goals. Failure with climate stabilisation sooner or later means "game over" for civilisation and all its aspirations. Each of these goals requires policy-making that can cope with issues that are interdependent to the point of being indivisible. Either all the above goals will be met together or none will be met at all.

1.2. POLICY PATCHES ON ISOLATED PROBLEMS

Political statements often recognise interdependence and occasionally infer codependence of goals but governments appear thoroughly unprepared for the consequences of codependence in policy or practice. The G8 leaders declared at their June 2007 Summit¹, "Complementary national, regional and global policy frameworks...must address not only climate change but also energy security, economic growth, and sustainable development objectives in an integrated approach.", yet entirely omitted any picture of how this jigsaw would fit together. Is it possible that neglect of codependence underpins the fragmented patchwork policies that allow many unsustainable impacts to continue worsening decades after they are identified?

1.3. DECOYS TOWARDS FRAGMENTED SOLUTIONS

Continuing unsustainability is popularly viewed as a 'conspiracy' between weak-willed politicians and powerful vested interests, as reflected by globally declining trust in both business and political leaders and declining hope for the future². A less obvious explanation would be that attention from codependence and 'joined-up' solutions is diverted by a set of 'decoy' attitudes such as:

- 'It's not my job.' Business, government departments and other institutions specialise within remits that cover only pieces of the goal-set. Anything outside the remit is someone else's responsibility.
- 'Divide and conquer.' There is a belief that complex problems can be made 'manageable' by separately planning for separate goals. The separated competing issues can then be 'balanced', 'prioritised' and 'targeted'. 'Links' can be explored.
- 'It's not realistic.' Persistent unsustainable development paradoxically lends support both to defeatist views and the illusion that whatever is done will be sufficient. Ambitious solutions are 'idealistic' and small improvements are 'practical'.
- 'It's us or them' The above decoys support a strategy of looking after one's own (family, organisation, region, nation or allies), at the expense of concern for all people (and nature). Security is sought within financial, geographical or organisational 'bubbles' where some goals are met for some people.

1.4. PROBLEMS CAN BE SEEN AS THEY ARE

The view of a world definable into compartments, each controllable by the power and expertise of specialists is so psychologically attractive, even addictive³, as to institute habits of perception and thinking. Yet global problems might be soluble only by seeing them as they are, not how they are accustomed to being seen. This requires new habits. Some notes are offered on an approach for handling the complexity of codependence along with two prospective economic interventions. The first instrument supports the creation of global cycles of reduced fear of conflict and reduced investment in weapons. The second instrument adapts the current waste-dependent economic paradigm so that capitalism and economic growth support the remainder of the goal-set. With these and other interventions, society may have the potential to meet global goals rapidly, reducing the risk that any combination of problems becomes irreversible.

2. Approaching global security

2.1. TRY HARDER OR THINK HARDER?

Policies based upon decoy attitudes rather than codependence have a common feature; they don't really work. In the past some goals have been met for some people at the expense of disturbances elsewhere and in the future. Many such disturbances have no boundaries (including pollution, conflict, disease, climatic instability, financial market volatility, forced migration and disease) and there are now no spacial or temporal



hiding places. "As the gap between the nature of our problems and the ability to understand them grows, we face increasing perils on a multitude of fronts⁴." More than US\$1 trillion annual global military spending is not making a safer world. Over 15 years of political negotiations to cut greenhouse gas emissions has not hindered steadily rising global emissions and accelerating climate change. A flood of authoritative data and recommendations for action has been published over past decades, with implementation being at best patchy. Is it enough to know what needs changing? What use are slow solutions for fast problems? Action is needed but should the next step be to try harder or think harder?

2.2. THINKING ABOUT WHOLE SYSTEMS

Bypassing decoy attitudes is initially just a change of mind. The incentive to change could not be greater; the opportunity to take part in the preservation of all life, including human civilization. However, the decoys define an approach to managing global complexity which will remain entrenched until an alternative approach can be taken up. The alternative of perceiving the world as a whole rather than separate parts exists as a cultural thread throughout human history. It was shaped into a 'systems theory' by Ludwig von Bertalanffy⁵ and others in the 1950s. C. West Churchman⁶ described a 'systems approach' where "...no problem can be solved simply on its own basis. Every problem has an 'environment', to which it is inextricably linked." We live in a world of systems which interlink every dimension of human experience with its physical and living environment. The complexity of the global system is infinite yet curiously this complexity is not necessarily an obstacle to achieving global security. Living systems (both ecology and civilisation) require and generate complexity, from which emerges a capacity for self-organisation, resilience and self-correction. Today's troubled society dwells in complexity, asking to unravel the endless detail of each problem. This serves to entangle decision-making in a jungle of data and to impede effective action.

2.3. TRAPPED BY THE GLARE OF ONCOMING ISSUES

If goals can no longer be met singly and change means changing the system there is the question of where to 'grab hold'? Systems thinking distinguishes between symptomatic effects, direct causes and underlying 'leverage points'. Donella Meadows⁷ defined leverage points as "places within a complex system (a corporation, an economy, a living body, a city, an ecosystem) where a small shift in one thing can produce big changes in everything". Society typically sees a problem as an existing or predicted symptomatic effect, such as a less stable climate, polluted water, illnesses, terrorist acts, rising population or recession. Each problem is considered to have a distinct set of direct causes. For example climate change is 'caused' by greenhouse gas emissions, which are 'caused' by burning fossil fuels. Everyone advises everyone else to reduce their emissions, and large portions of the population believe that stabilising emissions would stabilise the climate⁸ despite cuts well above

50% being needed to allow stabilisation after a time lag of decades (and if runaway change has not been triggered). Climate would not be stabilised by small changes in emissions levels so this does not appear to be a leverage point for change. The world is searching for its lost climatic stability under the lamp-post of direct causes rather than in the shadows of leverage points.

2.4. GLOBAL LEVERAGE POINTS

Human intelligence is well adapted to finding leverage points in everyday life or with technical complexity: ingenious solutions are routinely found for obstacles and bottlenecks. By contrast the decoy attitudes outlined above make global leverage points challenging to discuss. If global leverage points were obvious they would have been used long ago. Whereas symptomatic problems are increasingly glaring and most of the direct causes are tangible, the global whole cannot be perceived by individual senses. Individuals can feel globally connected but can understand the world only as a model. All modelling of parts, symptoms or direct causes is analytical surgery which cuts inter-relationships at conceptual boundaries. Models of global systems have the considerable advantage of a neatly defined boundary on a physical reality. Global leverage points offer the tantalising prospects of taking action on the scale of the problems and of cascading change. Meadows provided a list of 12 places to look for leverage points, with the most powerful being feedback loops, information flows, system 'rules', self-evolution, system goals and paradigms (shared beliefs). The last two places are probably not directly negotiable: "Please will you now give up your outdated goals and values?", though they may be reshaped by events, new language, feedback of information or new 'game rules'.

Possible leverage points may be indicated by one or more of the opportunities to:

- Resolve apparent conflicts between goals.
- Build-in a capacity for self-correction.
- Address multiple issues together.
- Support synergy between local (individual or group) goals and global goals.
- Scale-up or spread measures globally.
- Prevent additional worsening of problems.
- Use local knowledge in place of prescriptive controls.
- Recruit spare matter, energy, skills or wealth.

2.5. CAN THE WORLD SEE ITSELF AS A WHOLE?

If global systemic change is necessary then there is a role for individuals and organisations everywhere to discuss how to do it. The prospects for meeting global goals rise in proportion to the scope of this dialogue. Dialogues across issues, across institutions and across populations can introduce fresh thinking, question decoy attitudes, share visions of the future and build the quality of proposals until they may become usable. Although most people are rigorously trained since



primary school to work within separated topics, people have an innate ability to join-up ideas and develop scenarios of possible futures⁹. Dialogues could intentionally reduce barriers to participation and encompass the widest range of perspectives on formal and informal fora. Some leverage points, such as exemplary local action or new forms of philanthropy, are being led by individuals. Other conceivable leverage points are in the collective hands of governments, which may choose to join or lead dialogues. Multinational organisations are also well placed should they choose authentic dialogue¹⁰. Alternatively public dialogues may be initiated by any of a wide range of institutions just by asking questions. "Is it possible to solve climate change ahead of other problems?" "Can anyone's goals continue to be met without tackling global goals as a whole?" "What could align individual, corporate, national and global goals?" "How can freedom of choice be preserved and the discomforts of change be lessened?" "What can help people find leverage points?"

2.6. WHICH GOVERNMENTS WILL LEAD IN FUTURE?

Systems thinking presents a dilemma for governments, being incompatible with some institutional habits including (in the UK at least) "shared assumptions between politicians and civil servants that command and control is the correct way to exercise power"¹¹. Centralised command and control is partly restrained by democratic legitimacy and economic competitiveness. More centralisation risks less public support and weaker markets. With climate change the use of prescriptive controls (such as bans, rationing or punitive taxes) at a scale sufficient to more than halve emissions is unlikely to be welcomed. Centralised 'solutions' for waste such as expansion of incineration are unlikely to be welcomed. Military intervention in further oil-rich nations or loss of civil liberties in the name of counter-terrorism is unlikely to be welcomed. If centralised control is limited then new habits of thinking and problem-solving appear relevant for governments wishing to face intensifying challenges and remain in office. It remains to be seen which governments will adopt a leadership role. The following sections are not a recipe for success but an illustration of possible leverage points in the global economy. Intervention is needed with economics since the current 'rules' define a game which appears to be set to end with no winners.

3. 'Gross Peaceful Product' – energy security and national security

3.1. RESORTING TO CONFLICT

No-one is surprised at more violence in the news. State and sectarian military adventures, terrorist attacks, criminal violence and knife-carrying by kids all illustrate a degree of cultural dependence upon combative solutions to problems. Violent international crises have continued occurring at a rate somewhat higher than before World War II and violence continues to grow as the predominant crisis management technique for international conflicts¹². As oil dependence collides with

climate change, predicted scenarios include “political instability where societal demands exceed the capacity of governments to cope¹³” and “constant battles for diminishing resources” through which “warfare would define human life¹⁴”. A key indicator for cultural dependence upon the use of force is the money spent on weapons. This was recognised in Chapter 26 of the United Nations Charter¹⁵ where member nations agreed “to promote the establishment and maintenance of international peace and security with the least diversion for armaments of the world’s human and economic resources”. Less weapons spending means less weapons available for use and potentially greater investment in non-combative measures for all forms of security.

3.2. SHOULD GDP SUPPORT CONFLICT OR SECURITY?

The competing approaches to security were described in a July 2007 speech by British cabinet minister Douglas Alexander¹⁶ in Washington DC “In the 20th Century a country’s might was too often measured in what they could destroy. In the 21st Century strength should be measured by what we can build together.” Yet despite all efforts to agree disarmament and to promote the non-combative aspects of security, global military spending is estimated to have risen by 37% in real terms since 1997 to US\$1204 billion in 2006¹⁷. Thus the combative security paradigm and weapons spending may not be directly negotiable, suggesting a role for systemic intervention. An apparent leverage point is the contribution of weapons spending to economic growth. Growth of Gross Domestic Product (GDP) is seen as an indicator of national success and status, yet increasing weapons spending can more accurately indicate diminishing prospects. A correction of GDP for security may be distinguished from broad GDP correction for measuring concepts of well-being or progress. Broad GDP correction is unattractive to politicians (see 4.9) and is little use for guiding other decision-makers throughout the economy. However in the special case of security, the politicians most concerned with economic growth comparisons also decide the bulk of spending on weapons. Broad GDP correction deducts the economic costs of ecological and societal damage, whereas a security correction to GDP need not estimate nor predict damage from weapons.

3.3. A SYSTEMIC INCENTIVE FOR NON-COMBATIVE SECURITY SOLUTIONS

A corrected measure of economic activity, called Gross Peaceful Product (GPP), would be introduced as a replacement for GDP. Weapons-related spending would be deducted from GDP to define GPP. Economic growth would be calculated from GPP not GDP. Nations with a high dependence upon combative solutions would have lower GPP than if they prioritised non-combative solutions. Nations which foster weapons research and exports would have lower GDP than if they fostered more productive industries. Although spending on imports does not show up on GDP or GPP, nations importing large amounts of weapons would still have lower GPP due to domestic spending on procurement, training, storage, maintenance and decommissioning. Reductions in weapons spending



would boost economic growth since either taxes could be cut or productive spending could rise.

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3.4. CYCLES OF LESS WEAPONS SPENDING AND MORE SECURITY

Given that governments aspire to maximise economic growth, the current method of calculating GDP provides an incentive for politicians to spend more on weapons. GPP would reverse this incentive by rewarding the minimisation of weapons spending with higher growth figures. Although GPP does not constrain governments in spending what they believe is needed on weapons, the loss of potential economic growth would allow politicians more scope to question weapons spending. GPP would stimulate the debates about the relative contributions of combative and non-combative security measures. If security means global security then there is plenty to discuss. Nations could implement GPP as a diplomatic statement of intent to contribute to a more secure world. Even without global adoption, GPP would set a new benchmark for measuring the economic growth of all nations in which higher GPP and higher economic growth more accurately indicates future prospects.

A cycle of disarmament and reduced cultural reliance on force may be established due to:

- Other nations perceiving a reduced threat and cutting their weapons spending.
- Reduced political support and investment in weapons research and sales.
- Weapons becoming less available and more expensive.
- Lower incidence of conflict and demand for weapons.
- More effort with international co-operation.
- Young men seeing governments practice what they preach about non-violence.

3.5. ENERGY AND TERRORISM

GPP would not guarantee any country adopting a terrorist-resistant (decentralised) energy infrastructure nor would it block military adventures in oil-rich regions of the world. However it would create circumstances to progressively minimise conflict as a factor in energy security and to liberate vast flows of funds from weapons budgets. The argument that taking care of communities and nature is unaffordable would diminish. If GPP succeeds to emphasise non-combative routes to security then terrorist recruiters would lose part of their supporting motives. Other motives such as resource insecurity and 'decadent' materialism can be addressed by the following market-based instrument.

4. Preventive insurance against unsustainability – ‘precycling insurance’

4.1. FIXING THE CLIMATE MEANS FIXING THE ECONOMY

The security of both climate and energy would benefit from a reversal of historically rising global energy demand. Energy demand is shackled to society’s material metabolism (since movement of matter requires energy). This is driven by an economic paradigm that records a faster metabolism as greater economic growth. So a ‘successful’ economy moves more products (including fuels) faster and further before they add to waste levels and are replaced by new products. Energy demand could theoretically be reduced by mandatory emissions caps, carbon rationing and emissions trading though these involve a transfer of power from market choice to centralised control that may never be agreeable globally. Energy demand could alternatively be cut by phasing out the ‘linear’ economic paradigm, defined by its systematic accumulation of waste in ecosystems. This is relevant for climate change and other issues as explained by Karl-Henrik Robért¹⁸ in 1991, “Environmental degradation has many aspects but they are all related to one systemic error – linear processing of natural resources. The processing capacity of natural cycles is now exceeded by both the quantity and composition of our garbage. After steadily decreasing during the past billions of years of evolution, toxic substances are again accumulating in the biosphere – reverse evolution. ...In short, linear resource processing leads to continuous uncontrolled deterioration of socio-economic and public health conditions. It follows from the laws of thermodynamics that continuous linear processing of resources is compatible with neither wealth nor with life. ...The conclusion is unavoidable that we must transform our societies so that they function in harmony with the biosphere.”

4.2. A SYSTEMS APPROACH TO WASTE

Waste is a term with a range of understandings that tend to be used interchangeably: just two of these need be distinguished here; waste for disposal and ecosystem waste. Waste for disposal is an unwanted output from a process, such as waste water, exhausts and rubbish. Ecosystem waste is dispersed matter in ecosystems (land, air or waters) which cannot be reintegrated by biological or geological cycles (being either non-biodegradable or in excess of natural processing capacity). Waste ‘strategies’ answer people’s immediate concern of waste disposal, “how do we get rid of all that junk?” There is a focus on visible rubbish since air or water-borne waste often gives the illusion of ‘magically’ disappearing. However all disposed waste becomes either new resources (for people or nature) or ecosystem waste. Due to conservation of matter, wastes in ecosystems rise as natural resources fall. Climate change is the high profile example of wastes disposed to air becoming an ecosystem waste. Emissions exceed nature’s capacity to reabsorb them, allowing rising concentrations of atmospheric greenhouse gases. On a global scale zero waste for disposal is not achievable though zero accumulation of ecosystem waste would demonstrate efficient technical systems, healthy ecological systems and stable social systems. A systems



approach using ecosystem waste as an indicator of sustainability has been detailed by Azar, Holmberg and Lindgren¹⁹. Ecosystem waste can be built-in as a factor in market economics, offering a potential leverage point not just for waste disposal problems but for all sustainability issues.

4.3. THE RISK OF RISING WASTE IN ECOSYSTEMS

Conventional insurance works for localised risks. The value of an insured house is protected by a payout in case of a damage such as fire. However, global damage, such as an unstable climate, accumulation of heavy metals or species extinctions, can be irreversible so a form of insurance is needed to work preventively. Today's pattern of using resources is predominantly linear, from nature to products to ecosystem wastes. A leverage point at which to apply premiums would be on the risk of a product ending up as ecosystem waste. The vast majority of the technosphere could be covered, since chemicals, fuels, equipment, houses, roads and most other human works take part in the economy of products. Even product components and most natural resources are products. Every producer should already know if their product will add to waste levels in ecosystems. "Is our product recyclable or biodegradable?" "Have we contributed towards sufficient industrial and ecological processing so that our product can become a new resource in the market or in ecosystems?" This 'waste risk' is not harder to calculate than risks for conventional insurance. Due to global complexity it is not possible to account for externalities (ecological and social costs which are currently neglected by markets) by measuring, predicting and allocating every ecological, social and economic impact. However waste risk serves as a proxy measure of a product's contribution to unsustainability. This is comparable to the way that risk factors for calculating car insurance premiums serve as a proxy for unpredictable damage. Waste risk can also be seen as a 'language' to translate nature's pattern of handling resources into a pattern for society, without saying how everyone must live.

4.4. CIRCULAR ECONOMICS – JOINING UP THE RESOURCE LOOP

How could premiums be best spent to reduce the risk of products becoming waste and to prevent damage? Support is needed for a wide array of actions that build capacity to make resources instead of wastes. These actions build a circular pattern of resource use, or 'circular economics', as devised by Kenneth Boulding²⁰ in 1966. Boulding's circular economy takes part in a "cyclical ecological system which is capable of continuous reproduction of material form even though it cannot escape having inputs of energy." The goal of circular economics is now seen in national policy, for example in China's 11th five year plan (for 2006 to 2010)²¹. Sustainable development and circular economics may be implemented in practice by 'precycling'²² which is action taken to prepare for current resources to become future resources. Precycling builds economic, social and ecological capacity to prevent waste. Premiums charged to significant producers by insurers in proportion to waste risk would fund precycling. This generalises the 'recycling insurance' enacted

by the European Waste Electronics (WEEE) Directive²³, which funds recycling to cut the risk of particular products becoming waste. A generalised 'precycling insurance'²⁴ could address all products and all sustainable development opportunities.

4.5. BUILDING CAPACITY TO MAKE RESOURCES NOT WASTES

The following opportunities for precycling are sufficient to 'precycle' any product. They are intended to cover the same range of opportunities as Karl-Henrik Robèrt's 'system conditions' for sustainability²⁵. Precycling is action to:

1. Cut dependence on substances from the Earth's crust that already accumulate as ecosystem waste (fossil fuels, heavy metals, radioactive compounds).
2. Give products (any part of the technosphere) a future as a resource in nature or the market-place. Efficiency allows 'saved' materials (including fuels) to not become waste. Products can be designed to be recycled by industry or nature. All necessary infrastructure and arrangements can be in place before products require disposal.
3. Expand the diversity and range of ecological habitats (including crop-lands and conservation of existing natural productivity). This raises the capacity to process non-solid emissions into clean ecosystems and natural resources.
4. Meet more people's material and non-material needs. Failure to meet needs (through either poverty or cultural materialism) means more waste. No human need inherently has to cause ecosystem waste.

4.6. INSURING AGAINST UNSUSTAINABLE DEVELOPMENT

Precycling insurance follows previous models of insurance. Fire insurance began in 1680 with preventive investment in fire brigades²⁶, not payments for damage. Today insurance is still partly preventive, with premiums lowered for example when security measures are installed. Third party liability insurance is typically obligatory for vehicles and workplaces, with premiums handled by insurance markets, not government. The overall purpose of insurance is to avoid people being financially 'wiped-out' by things going wrong. Insurance is non-prescriptive, with the advantage of creating change cost-effectively, making use of local knowledge and stimulating innovation. Policy-makers are not required to guess what would be the best solution for every unforeseeable circumstance. Precycling insurance would be obligatory for significant producers but also entirely non-prescriptive and producers could choose how and even whether to cut waste risk since global waste risk can be cut both by their investments and via the premiums. Producers seeking to avoid premiums would invest in giving their products negligible waste risk. This provides a 'cradle-to-cradle'²⁷ lifecycle for 'precycled' products. Those who choose to continue making 'prewasted' products would pay a premium and find their products less competitive in a market where alternatives are rapidly developed. Precycling insurance would provide strong signals also to investors and customers about what to expect. Many precycling actions cost little or



nothing so small per-item premiums could add up to support large-scale changes.

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4.7. PRINCIPLES FOR INVESTING PREMIUMS

The investment of precycling insurance premiums would bridge the gap between what is being done and what is needed. Premiums could be invested either directly by precycling insurers or through intermediaries according to some foreseeable principles. Investments should:

- Work preventively, for example primarily aiming to stabilise the climate, not to accommodate worsening weather nor to recover from disasters.
- Aim high, for example by expanding productive diverse ecosystems and designing urban areas that contribute positively to the ecology of their region²⁸
- Add to people's options for living and working, for example by supporting new research, trends, jobs, processes, products, collaborations and hope.
- Support people's enthusiasm, for example by facilitating local and sectoral dialogues about the future, including monitoring and proposing investments.
- Fit together into plans for the future, for example using the Natural Step process²⁴ visually to explore what can be done over time.

4.8. MARKET RENEWAL NOT MARKET CONSTRAINT

Unresolved global-scale problems are expensive. The prescriptiveness and complexity of governmental constraints on economic activity are expensive. Both these expenses undermine economic stability and growth yet both may be avoided by allowing the market to fulfill its responsibility for externalities. This is a chance for capitalism to be seen not as a 'villain' to be constrained but as a 'hero', creatively and rapidly generating solutions. Governments would legislate, regulate and oversee precycling insurance, but unlike taxes, they would not handle the funds. This division of responsibilities should enable transactions to be accountable to the public, building a level of trust not achievable with any expansion of taxes. A barrage of specialised regulatory and market-based instruments could be phased out. The market distortions inherent to patchwork instruments need no longer obstruct action. A level playing field for all significant producers could be achieved with global introduction of precycling insurance, with insurers accredited by government, certified systems for investing premiums and web-based information open to public scrutiny. Simultaneous international introduction would avoid extra accounting burdens with cross-border trade. Administrative effort, regulation and long-term prices would be minimised while prospects for achieving the global security goal-set would be maximised. In a renewed market the self-interest of customers and investors would stimulate change faster than any possible attempts to constrain the economy.

4.9. GROWTH OF WHAT?

Many countries have been experiencing relatively stable and positive growth of GDP in recent years. Part of this GDP is spending on the side-effects of linear economics such as; upgrading of protections against terrorism, fraud, thefts, floods, winds, heat and drought; surveillance, policing and prisons; treatments of polluted water and land, physical and mental illness; involuntary migration and poverty; advertising, sales and servicing of debt; clearance of ecosystems and extraction of diminishing resources; development, stockpiling, use and consequences of weaponry; disposal and replacement of unrecyclable products and infrastructure; over-regulation and costs of compliance; and higher prices arising from all the other side-effects plus insurance and taxes. From a GDP perspective this can look like a growth bonanza. Little wonder that politicians continue to promote a measure that delivers 'success' irrespective of policies or events. The inventor of GDP, Simon Kuznets²⁹, commenced the critique of GDP in 1934 by complaining to the US Congress that GDP was not designed to measure success, "The welfare of a nation can scarcely be inferred from a measurement of national income...". Kuznets' advice to watch what was growing remains relevant. With unproductive activity and economic inactivity growing, global economic growth is at risk. Stern³⁰ estimates a 5-20% penalty to GDP in case of failure with the climate stability goal. If combined with failure with other global goals, the potential penalty is harsher. Growth based upon linear economics appears to have no future.

4.10. A FUTURE FOR GROWTH

Politicians may be relieved to hear that (so long as current problems are reversible over time) growth can continue - but not growth as usual. GDP (or more usefully, GPP as above) which preserves the resources on which it depends may expand with no theoretical limit to the quantity of final services that can be produced from a given physical resource input³¹. Growth can be generated not from faster metabolism consuming more physical resources in more frantic effort but from activity which meets needs, prevents rising concentrations of wastes and generates new resources within industrial, ecological and geological cycles. Continuing economic growth may be underpinned by activities which adapt society to a circular model within growing ecosystems. Both precycling insurance premiums and their investments would add to growth. Funds currently lost with the unproductive costs of preventable problems would be freed for purposeful investment. People whose needs are unmet could become more economically productive. Valuable work which is today unfunded could add to employment levels and growth. An economy which protects resources in cycles has prospects for long-term growth and stability that are unavailable to an economy which creates scarcity by losing resources as wastes.

4.11. ALL FUELS CAN BE RECYCLED

Precycling insurance would reform the energy market, effectively shifting funds from sales and investment in waste-dependent fuel



products to the precycling of fuels. Producers' responsibility could be met either by making precycled fuels (with negligible waste risk) or paying premiums based upon waste risk. Fossil fuels, nuclear and mixed-waste derived fuels can be precycled by phasing them out. The existing infrastructure and skills can be reused or recycled. The option of carbon capture and storage may also work if the carbon remains safely stored over geological time-scales, storage does not release replacement fossil fuels and the costs undercut the other options. These costs would be paid by fossil fuel producers. Nuclear fuels can be similarly considered with waste risk and end-of-life processing settled before sale of the fuel. Renewable fuels are precycled when productive ecosystems are expanded sufficiently to absorb their waste products. More productive ecosystems can support higher energy use. Solar, wind, tidal stream and geothermal energy need not make waste in ecosystems, though equipment, components and infrastructure are all products with waste risks. For example a biofuel from crops grown on cleared rainforests and using fossil fuel products in production, would involve significant global waste risk. All fuels can be partly precycled by greater resource and energy efficiency. Energy which need not be produced does not make waste. Materials which are not needed do not require energy to process. Technical opportunities for efficiency are well-documented. According to Friedrich Schmidt-Bleek³² "...the resource productivity in western countries has to be increased by at least a Factor 10, compared to today. A dematerialization of this magnitude will also dampen the energy demand by ca. 80%, opening completely new vistas for de-carbonization and for supplying sufficient energy to the 2 billion poor of this world."

4.12. AN ALTERNATIVE TO EMISSIONS CAPS

Although some of the above actions are underway they are currently led by mild market, regulatory and cultural signals, allowing no realistic chance of decoupling economic growth from energy demand. Support for counter-productive actions (e.g. fossil fuel infrastructure, long-distance transport, overharvesting and encroachment of habitats, nuclear power and expansion of incineration) exceeds productive investments. Precycling insurance would add a large flow of productive investment and provide strong signals to financial markets and governments for counter-productive investments to be switched over. Although mandatory emissions limits are conventionally assumed to be essential, climate stability may be more quickly and reliably achieved without them. If precycling insurance proves to be politically easier to agree than global mandatory emissions caps, energy rationing and whole-economy (business plus individuals) emissions trading systems, then it could be possible to generate actions that rapidly cut emissions and prevent the avoidable worsening of climate change (some worsening is unavoidable). At this point the outlook for all global security goals would be brighter. It would then be possible to discuss the lowering of atmospheric greenhouse gas concentrations, the ending of human-induced extinctions and a global economics of abundance – aims which are not quite conceivable today.

5. Conclusion – prepare for the unexpected

5.1. UNSUSTAINABILITY WILL END ONE WAY...

The proposed instruments are no panacea. Despite many aspects of human progress, a legacy of trends (such as with energy dependence, tendency to conflict, population, market volatility, materialism, stress, pessimism, addictions, crime, poverty, inequality and diseases) impede further progress. These trends may all be reversible though whatever is now done, further difficulties will arise for decades (due to time lags in complex systems). Some trends will benefit from further instruments at other leverage points. The codependence of energy security, climate stability, sustainable development, economic growth and national security suggests a role for both Gross Peaceful Product and precycling insurance. If only GPP is applied then conflicts over declining oil reserves, affordable food, clean water and productive land³³ may worsen. If only precycling insurance is applied then vital public funds could continue to be diverted into stockpiling of weapons. If both GPP and precycling insurance are applied then it may be possible to experience economics designed to generate solutions rather than problems. What is the human potential for ingenuity and shared endeavour? The pace of change may be surprising.

5.2. ...OR ANOTHER

Possible approaches to the complexity of codependent goals may be disregarded by policy-makers who remain most comfortable with their existing habits. Society's attention may be otherwise occupied. The default option of progressively tougher patchwork policies invites an outcome that no goals are met amidst emerging combinations of ecological, financial and societal disruptions. Again, the pace of change may be surprising.

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