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CLIMATE: HOW TO WIN

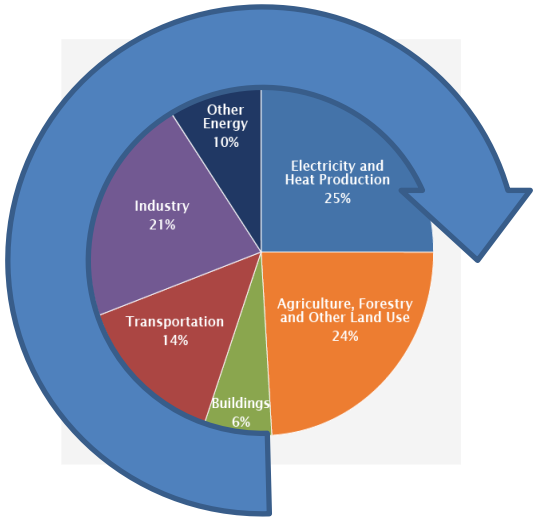
BY HAL HARVEY ● APRIL 2016

The climate problem is enormous: It threatens much of modern civilization, and its principal source, in burning hydrocarbons, is embedded in most of the modern economy. Because of the ubiquitous nature of the source of climate change, and the variety of frightening but uncertain consequences, many opinion makers, policymakers, and citizens begin to feel paralyzed: Can nuclear power solve the problem? Is a carbon cap the right idea? Conserving forests in South America? What about carbon capture? Solar and wind? Will global treaties work better than local action? How about national policy or individual behavior change?

A handful of insights, grounded in careful math, can clarify the situation, and point out a straightforward path to a reasonable climate future. And while the pathway is not easy, it is certainly feasible, especially if our collective work is better focused.

This short paper is designed to cut through the clutter, and point to a reasonable, cost-effective solution to climate change, with clear steps to get there. The paper focuses on energy-created carbon dioxide (CO_2) and other greenhouse gases, which contribute about 75 percent of climate forcing. This is not to minimize the importance of deforestation, but to get at the heart of the problem, and to produce a manageable strategy for this large part.

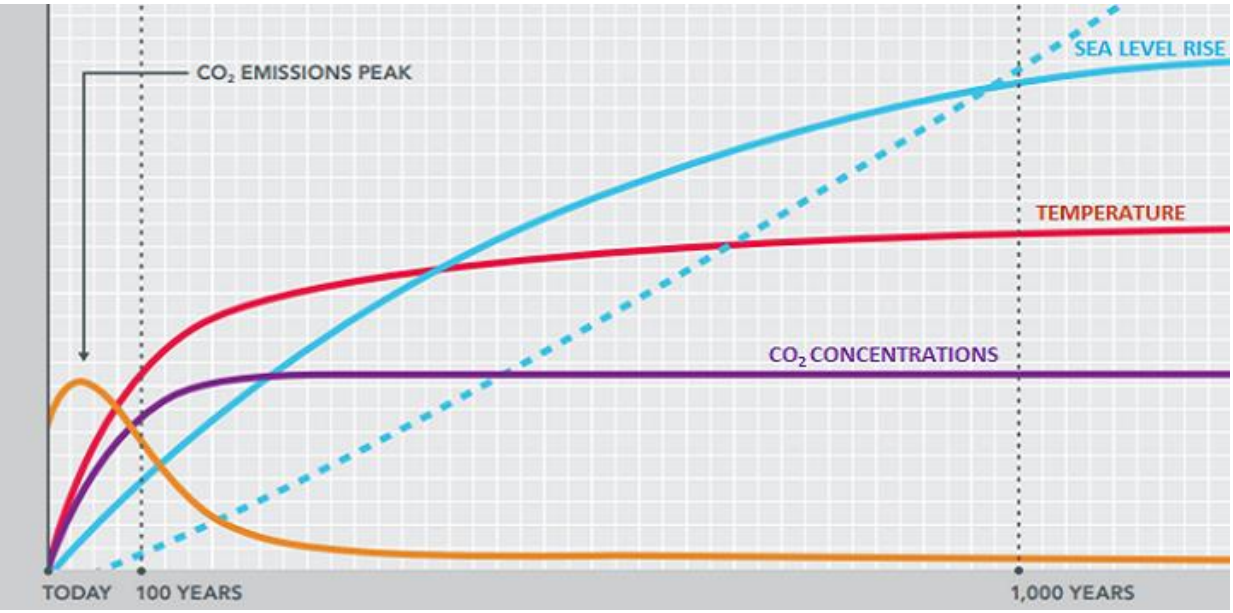
Greenhouse Warming Share from Energy



A WORD ABOUT TIMING

Both the stakes and the opportunities in climate change have risen markedly over the last few years, and this combination of threat and opportunity argues for a serious, immediate push on a few policies that can make a big difference. To land at a reasonable carbon future requires speed, focus on intelligent policy, and intensity.

How have the stakes gone up? First, the insidious mathematics of carbon accumulation show that lost time creates essentially irreversible damage, and the carbon we emit now creates further damage every year for well over a thousand years. The only way to deal with this imperative is to pursue strategies that deliver large tons of emissions reductions, early. There is no reasonable long-term future unless we play the short term well. Waiting for miracles is a surefire recipe for losing.



Second, failing to stem concentrations of CO_2 soon will begin to unleash runaway feedback loops—often called tipping points—such as methane released from thawing arctic tundra, which will accelerate whatever damage humans have already caused, conceivably beyond any human capacity to control. A recent paper by Hansen *et al.* argues that ice melt in Greenland and Antarctica could dramatically accelerate, making most coastal cities uninhabitable in a matter of decades to a few hundred years. Only early action can present this runaway feedback. And third, the effects of climate change are themselves non-linear—as weather extremes become the norm. Add all of this up and it becomes clear that climate action in the next 15 years is crucial.

"The economic and social cost of losing functionality of all coastal cities is practically incalculable."
Hansen et al.

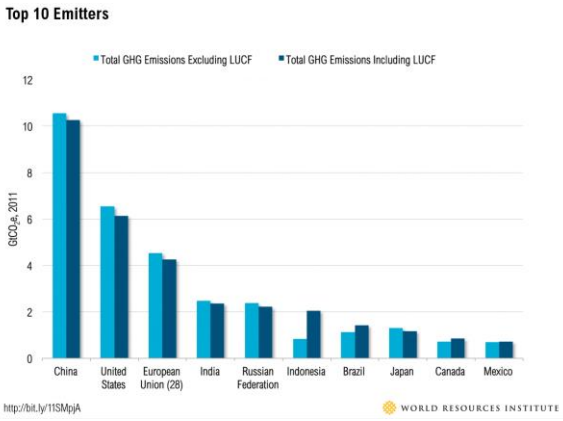
Against those fearsome trends, recent technological developments make solutions available and affordable. The plummeting costs of solar, wind, advanced lighting, new manufacturing techniques, and more mean that clean energy can finally graduate from the boutiques to the mainstream. Political commitments in some jurisdictions have proven that this rapid transformation is possible—with a number of states and countries well north of 20 percent renewables in less than a decade, and on a path to 80 percent emissions reductions by 2050. The California and New York electricity grids, for example, will have 50 percent renewables by

2030; add in existing nuclear and hydro, and their electricity systems will both be close to 70 percent decarbonized in just the next 15 years. The challenge, then, is to accelerate the new clean technologies, and to turn the nascent political commitments in Paris into unstoppable change.

Here's how.

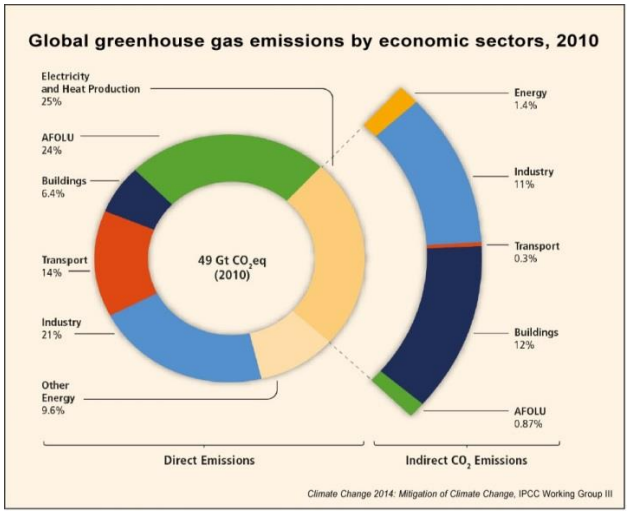
20 COUNTRIES MATTER. WIN THERE, AND WE WIN

The first thing to do is focus on the key countries. Eighty percent of carbon emissions come from the largest 20 carbon-emitting countries, with China and the United States holding the top posts. If these countries have downward trending carbon emissions in the next five to ten years (later for the poorer countries, earlier for the richer), then we can land at a decent future. Failure in these countries means global failure.



Carbon reduction can only happen in individual power plants, buildings, vehicles, and factories, so no matter what sort of international regime or treaty is established, it comes down to action in China, France, Mexico, and so forth.

IT ALL HAPPENS IN FOUR INDIVIDUAL SECTORS



A low-carbon economy requires **electricity** from renewable resources, near-zero energy **buildings**, vastly different **manufacturing** processes, and a super-efficient **transportation** sector. The effectiveness of every treaty, financial instrument, and policy should be measured by how well it translates into on-the-ground change in these four realms.

As the chart on the left shows, electricity (the beige band, broken down in the arc), buildings, industry, and transport are the big sources of energy CO_2 emissions—with agriculture, forestry, and land use (AFOLU) taking up the balance. This paper only covers the energy aspects

A FEW POLICIES ARE KILLER APPS

In each sector, there are only a small number of policies that make a difference. **Selecting the right policies and ensuring they are properly designed and implemented, in the 20 top-emitting countries, is the path to victory.** When we look at broader strategies—for example, a global treaty or a financing scheme—we should judge the effort against its potential to drive these specific sectoral policies.

FOR BUILDINGS

1. A **good building code** is the only policy that has delivered large-scale, sustained energy efficiency in building shells. The two caveats: it must be well-designed, and it must be properly enforced. The best building codes set strong performance standards, and then ratchet them up every few years. This **continuous improvement** turns out to be a key feature across the board, as it inspires new technologies and new practices. California's code has gone through a dozen increments in the 30 years since it was adopted, and new buildings now use about 80 percent less energy than those built before the code. Zero-net energy is the next big step. Codes that can be met with either a spec sheet (e.g. double-pane, low-emissivity windows; R19 insulation in the walls) or an overall performance standard, certified on a state-approved computer model offer great flexibility to builders.
2. **Energy efficiency standards for appliances and equipment,** getting predictably and steadily tighter over time, have delivered massive energy and consumer savings, and they are far from fully exploited.

FOR TRANSPORTATION

3. **Fuel efficiency standards**—or their equivalent, carbon emissions/mile—have doubled the fuel efficiency of car fleets and are in the process of doubling them again. That is heroic. These, too, should have continuous improvement so that auto manufacturers can see the value of R&D and of developing new technologies—in motors, transmissions, lightweighting, aerodynamic drag reduction, and so forth.

   The ultimate focus of this work must be the electrification of the fleet, as there are no low carbon liquid fuels on the horizon. Electrification of transportation, heating and cooling, and ultimately more industrial processes offer huge carbon advantages, provided the grid becomes zero-carbon, rapidly.

4. Standards work best when they are complemented by a **price signal**—a gas tax, carbon tax, or a "feebate," which is a fee charged against inefficient cars and rebated to those who purchase the most efficient.

FOR UTILITIES

The electric utility industry is already in the midst of a big transition: Old coal-fired power plants are being shut down, the grid is getting more sophisticated and flexible, and renewable energy is becoming cost-effective. But utility stock turns over slowly, and progress can easily stall. The best utility policies are:

5. A renewable portfolio standard (RPS) requires generators to bring an ever-increasing fraction of renewable energy to the grid. Accompanying an RPS with a price-finding mechanism, like a bid system, is extremely efficient.
6. Having the utility devote resources to customer energy efficiency whenever that is cheaper than supply—through "decoupling" or performance-based regulation.
7. In general, restructuring utility incentives so they earn most when they best deliver the four key services—reliability, affordability, safety, and environmental amenity.

FOR INDUSTRY

8. Equipment standards for motors, air compressors, and other industrial equipment drives down energy waste. Some countries have managed industry best practice pledges, wherein companies agree to hit top-quartile performance.

POLICIES THAT HELP ALL

9. Pricing carbon according to its social cost is the policy favored by many economists. It reaches across sectors, and affects both capital and use decisions. Pricing carbon is highly useful, but is no panacea, as several sectors and many consumers are effectively indifferent to price signals.
10. Research and development has a fantastic payoff, especially over the long run. Virtually every major energy technology in use today has either been borne from, or was significantly advanced by, smart federal R&D.

These policies, properly designed, in the biggest 20 nations, will land the world on a reasonable carbon future. Each of these policies has proven effective somewhere, though no major jurisdiction has used them all.

IT REALLY MATTERS TO GET THE POLICY DESIGN RIGHT

There are a hundred ways to misdesign any single policy. If a government fixes a price for a subsidy, it will either be too high, wasting money, or too low, failing to achieve its social objective. Opportunities to game policy abound. A brief summary of policy design principles to avoid these and other unintended consequences follows, but for fuller treatment, see this paper.

- Set goals and let the market work out the best solutions. Specifying a technology, or specifying a price, risks undermining the power of markets to innovate.

- Require continuous improvement. Setting a fixed target, for example, renewable energy supply, becomes a *de facto* plateau. Instead, use the political moment to set a steady annual improvement of, say, three percent.
- Go upstream. Aim to capture 100 percent of the market. Where possible, policies such as a carbon tax should be assessed as far upstream as possible—at the mine mouth and well head, for example. This reduces complexity and minimizes gaming.
- Facilitate private sector investment and innovation. There is a concept called "Investment-grade policy" that takes into account the full suite of issues a private sector company must consider—siting, permits, power purchase agreements, and so forth—and builds a policy environment that adds certainty in all realms. This can dramatically cut the cost of new technology.
- Work to design policy that takes advantage of natural capital stock turnover. This can save vast sums of money.

Why the emphasis on **getting policies right**? Consider fuel efficiency standards for autos, which can cut energy use in half. A poorly designed standard (with examples in parentheses) will:

- Trade-off fuel efficiency for air pollution (EU diesels)
- Reward consumers for purchasing trucks (U.S. CAFE)
- Bias the market toward heavy cars (Japan, China, India, Korea)
- Regulate the wrong characteristic (China displacement-based standards)
- Fail to improve as fast as technology allows (U.S. CAFE wasted *30 years* of improvements, costing the U.S. more than $1 trillion)
- Encourage automakers to optimize for tests rather than real-world conditions (ubiquitous)

GETTING THIS DONE: ONE PROVEN, AFFORDABLE IDEA TO PURSUE

The Paris agreement in December 2015 was a high-water mark for political commitment to climate change reduction. More than 190 countries delivered plans, which ranged from poor to very good, on abating carbon. But few have the expertise to properly select, design, and implement the policies required to meet their own plans.

Designing good policy requires deep system knowledge, access to experience in other countries, a serious dive into the local conditions, consultation with domestic and international experts, and above all the experience to determine what will succeed. Few jurisdictions have those resources on-hand. For the cost of a few million dollars per year, spent on the right domestic and international experts, countries can develop outstanding policy packages. That catalytic investment will then influence billions of dollars in sound energy infrastructure.

Providing this expertise requires building and expanding on "best practice" expert teams—and making them available for free or at a low cost—on request from decision makers. The teams must be equipped with case studies, data, computer models, experience in many countries, and top experts. They must be able to rapidly answer questions and work on-site for months. They must work with, learn from, and help train local experts in every engagement. And they must deliver policy-ready material, in policy-relevant timelines.

This method has been pioneered with the Best Practice Networks (BPN) of the ClimateWorks Foundation, with six international centers established, one each for vehicles, utilities, industry, buildings, appliances and equipment, and urban planning. As an example of the power of this mechanism: one of these centers, the International Council on Clean Transportation, has focused on fuel quality, fuel efficiency, and low-carbon fuels—for cars, trucks, planes, and ships. They have an international staff with about 30 engineers and policy experts in offices in the U.S., Europe, and China. Their work has already helped with policies that will abate one gigaton per year of carbon emissions in 2030, and they have another 1.5 gigatons in their sights. Similar opportunities abound in each sector.

A Best Practice Network is not a consulting company, nor does it offer a menu of undifferentiated options. BPNs are devoted to, and capable of, building great policy in their realm of expertise. They work directly with decision makers and agencies to assess the potential of different policies, go through the difficult questions of implementation, stick around to help overcome hurdles, and then help fine-tune the solutions as it evolves. They always work with, learn from, and train local experts so the work has a long lifetime.

BPNs must have:

- Serious technical depth
  - Experience designing and implementing policies in many different political settings
  - A library of best practice policies for their sector

    - Computer models ready to adapt to different countries
- Proven ability to work in different cultures, economic systems, and languages.
- Understanding of and commitment to best practices, ready to adjust to local conditions
    - Commitment to cost-effective strategies
    - Understanding of the overlay of technical potential, economic necessity, and political reality in driving toward solutions
- Commitment to working in country. Commitment to training
- A serious track record
- Cost-effective structures

Their success must be measured by real-world change—in good policy, well-implemented, making a difference—not in papers produced or meetings held.

BPNs must be free to pursue not only the best carbon abatement policies, but to select venues with the most potential for change. That can be assessed by overlaying the carbon abatement potential with the political commitment. For example, if China wants to lead on super-efficient appliances, and is both a big market and a big exporter, and there is a clear signal from the government that this is a priority, then the appliance best practice group (CLASP) would dispatch experts. If the carbon abatement potential was small, or the decision makers reluctant, then the venue would be passed. This kind of triage is necessary to make the rapid advances the world needs to avoid serious carbon buildup. This is also why the effort must operate independently, and not be anchored by, for example, UN politics and practices.

CONCLUSION

Great progress can be made on climate change if, and only if, the major countries adopt smart energy policy, quickly. Helping them gear up to do it, building on existing political momentum, is a winner.