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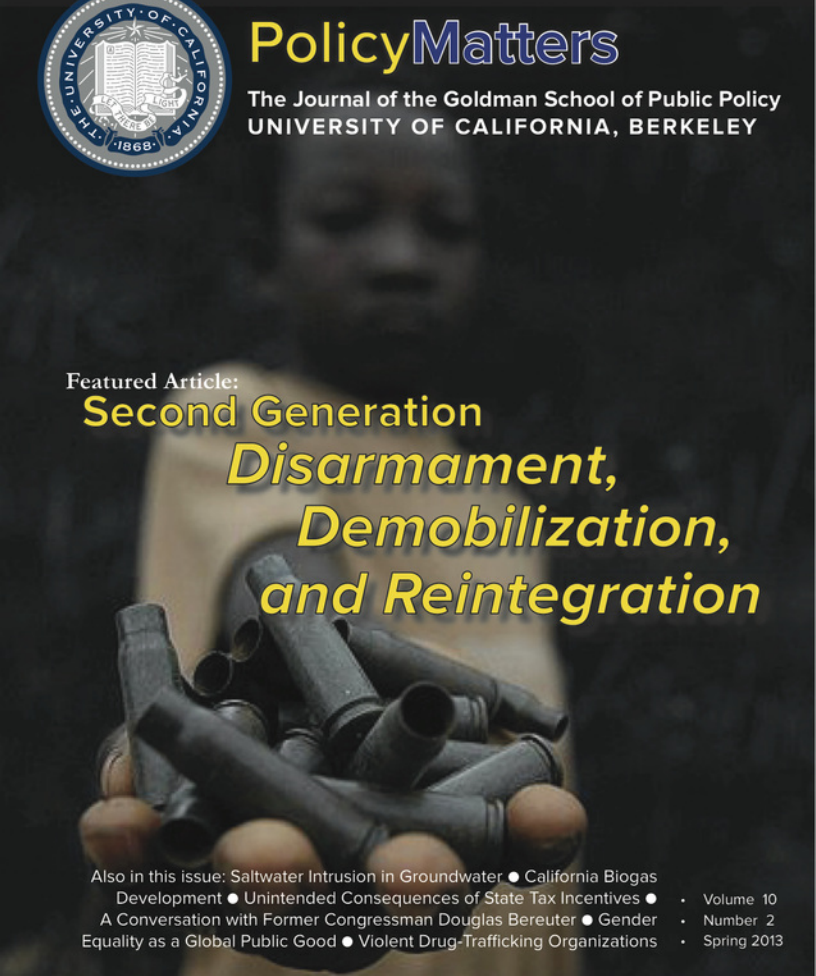

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Can the World Feed Nine Billion People?
A Conversation with Former Congressman Douglas Bereuter

INTERVIEW BY LEONARDO COVIS AND KEVIN MCNELLIS


Photo by Keleigh Annau

Douglas Bereuter represented the 1st congressional district of Nebraska in the U.S. House of Representatives from 1979-2004. A member of the House Select Committee on Hunger for its entire period of existence, Bereuter is well-known for his for global hunger and agriculture initiatives. He started the USAID Farmer-to-Farmer program, which provides voluntary technical assistance to farmers, farm groups, and agribusinesses. More recently, he served as the President and Chief Executive Officer of the Asia Foundation until 2011. He is currently a member of the Chicago Council on Global Affairs, among other activities.

PolicyMatters sat down with Congressman Bereuter during his visit to the University of California, Berkeley, to discuss global food production, the President's Feed the Future Initiative, and his perspective on the challenges facing Congress.

Douglas Bereuter recently visited U.C. Berkeley to give the annual Matsui Lecture at the Institute of Governmental Studies. After the lecture, he sat down with two PMJ editors to talk about his ideas for feeding the world's growing population and how popular conceptions of genetically modified food may be hindering the effort.

PolicyMatters Journal (PMJ): *What kind of technological advances are needed to improve production, especially for small farms and farmers?*

Congressman Bereuter: Many things of course, but I think within the top category of technological advances will be advances in seed and plant technology. Not only more production from the plants that are grown for food purposes, but also in terms of better drought-resistant, pest-resistant crops.

There are examples in parts of West Africa where cell phones are readily available, perhaps distributed free by commercial enterprises. You've got subsistence farmers working with a microcredit bank to purchase things for their farming operations—even though they're very small—to tap into technology resource centers where they exist.

In Rwanda, which has [one of] the highest population densities in Africa, just the introduction of a new variety of sweet potatoes – which is nutrient intense and has high beta-carotene characteristics that the body turns into Vitamin A – helps you avoid the Vitamin A deficiencies that kill so many children every year. Nearly 50 million children annually in Africa suffer from Vitamin A deficiency related diseases. It can even be fatal for pregnant women

PMJ: *So what's the balance that needs to be struck between the food technology of these new sweet potatoes and the infrastructure technology of the banking on cell phones?*

Bereuter: You've got 560 million people that suffer severe poverty already in this world, and we're headed between now and 2050 for a 33 percent population increase by conservative projections. So you're talking about how you're going to move to feed 9.2 billion people when you now have a little less than 7 billion people, and most of those gains in population will take place in Sub-Saharan Africa and in Asia.

…Most of the poorest people in the world living on less than $1.50 a day, sometimes as little as 90 cents a day in parts of Rwanda, are rural in their location. Most are involved in subsistence farming.

We need to help the smallholder produce more to feed their

CONVERSATION

own family. We find that over 50 percent of the farmers in subsistence farming are women. In fact, in some countries they produce 70-80 percent of their crops. That's certainly the case in West Africa, where the women are the major producers there. We find that if you can put new technology and new technical assistance in their hands, and give them microcredit and make it profitable for somebody to deliver microcredit, you can dramatically increase the production of food on that subsistence farm, perhaps to the point they have excess.

If you put—it's been proven—money in the hand of the woman farmer, it's more likely to translate into food for her children, education, and a healthier child. So there is a reason to focus on bringing the comparative advantages of science and our agricultural research institutions (especially our land grant colleges) and work with women to increase production dramatically. That's one of the priorities of the Feed the Future program.

PMJ: *How is it different to try to reach women farmers with these technology advances as opposed to not targeting it towards women?*

Bereuter: Some cases you have to deal with the cultural and gender bias of the country. In many cases, it is recognized by certain countries in Africa, for example, that to really increase production, you need to focus on women.

Our approach was to choose, under USAID direction, twenty key countries, five of which were assessed to be phase-two-ready countries ready to go. In every case, there's an environmental filter on our objectives so that we're not producing something that's not sustainable.

[On a project in Mali], we're taking the priorities of the Mali government. We're giving microcredit availability and loan guarantees to the individual women farmers. We're giving them new processing techniques. We have helped form a 2,000-member cooperative that owns the new processing equipment that does transportation marketing for these women. Suddenly they are producing not only enough for their family and a higher income, but an export that's transforming their lives.

So, it is not telling them what to do. It is assessing: does it meet their own principles? Is it going to increase production in a sustainable way? Is it going to be climate change friendly? Is it something that the government will pick up and support? Does it have the likelihood that commercial enterprises will come in and provide some of the technology?

PMJ: *If we're talking about trying to increase food production by 33 percent...*

Bereuter: In reality as people get wealthier, they have a higher demand for caloric intake and different foods, so we actually need to raise about 50-60 percent more food.

PMJ: *So how do genetically modified crops fit into [increasing food production]? Are they a necessity? Are they going to be required to meet that goal? Is there a way to feed 9 billion people without them?*

Bereuter: I believe there isn't. I believe they're necessary. I know that's controversial, but in fact, most of the concerns about GMOs are ill-informed. You're also going to have a more sustainable type of agriculture, because in many cases, these plants, these seeds…are drought resistant…, and don't have problems with certain pests and diseases, so they dramatically increase production.

If you want to see inflammatory rhetoric, look what they say in the European Parliament, for example. They are saying to African countries: we will not accept your exports unless you stop using or avoid using GMOs.

You cannot feed, in my judgment, the additional people on earth by 2050 if you stop scientific research.

PMJ: *What would you put as your top priority [to combat global food scarcity]?*

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Bereuter: The authorization for the American participation in the Global Agriculture Development Initiative, which was key to getting the other countries and international institutions to get on board and make their pledges, runs out on June 30th of this year. The Global Agriculture Development Initiative will reduce poverty and start us down the track of being able to feed the population of the world in a reasonable fashion, adequate nutrition.

I guess I would say the first priority is an authorization bill, preferably a no-year, … perpetual authorization bill. If you can't get that, you ought to go for a ten year authorization or at the minimum a five year authorization, so we can sustain this effort. Also, we have as a parallel issue then proceeding with an appropriation bill to implement it.

There are questions on how you're going to get continued authorization and appropriation to implement it. How much of it will be a Congressional initiative by finding champions to move a bill? How much should be the Obama administration leading the effort? Will that alienate the Republican majority house if it's the Obama Administration?

I say play to the strengths of America, play to our comparative advantages. One of our comparative advantages is our land grant institutions and other agriculture research, and the symbiotic relationship between the private sector and our land grant institutions. We are the envy of the world when it comes to agricultural and food research, especially the extension from the university to the farmers. And we have reaped the benefit of what we've done internationally by the kind of products that we've produced that are used by our own farmers. That's a comparative advantage I think that we have.

Although our lead may be shrinking, we still have a science and technology comparative advantage over any other country. I say don't spend your money doing physical infrastructure; you exhaust your money in a hurry, even though that's a big need in Sub-Saharan Africa. You let the World Bank and the other multilateral institutions and the Chinese build the infrastructure. They love to build visual infrastructure to get all the credit. Let them do that. We'll do [in areas]where we have a comparative advantage.

But overall, most of the research for agricultural products for input and for seed and production is done by the private sector, so you have to motivate the private sector to do this. That means there has to be a visible profit or benefit, and you have to leverage them. You have to somehow use your innovative techniques, leverage, and incentives to get them to focus a significant part of their effort on smallholders, not on commercial agriculture and large-scale. That's an interesting trick, and it's important.

PMJ: *What is it in it for [the private sector] to feed people in Africa?*

Bereuter: In many cases, the parts of the agribusiness sector that are most likely to be initially supportive are those areas that provide the inputs. Not the production of food itself, but the input to the individual subsistence farmer. Whether it's technology, seeds, or plants, that's where most of their effort will probably come initially, and that's where we have a huge advantage.

We have, I think wisely, decided to focus on women farmers in our program here in the United States. I hope the other countries are doing something similar. It makes sense; the idea has good receptivity in places like Ghana, which has one of the best records in increasing its GNP and its agricultural production. You need good leadership in these countries, obviously. You need to, in some cases, avoid countries that have endemic corruption right up to the top.

Trade barriers are a huge problem, as are the subsidy programs in many of the developed countries. It surprises most people to find that the OECD countries once, in the relatively recent past, were giving [over 10] percent of their total aid directed towards agriculture. Now it's dropped down to 6 percent. So part of it is the way the resources of the OECD countries have been devoted, and this is an effort to turn it around.

Back in the 50s and early 60s, many of our land grant institutions and other major research universities had partner institutions abroad. They helped create or increase the capacity of a partner university in this country or that country. Not only did you help them with their programs and the training of their faculty, but you had exchange students back and forth and exchange faculty back and forth. I know at my alma mater, University of Nebraska, we helped actually create a new agriculture campus in East Turkey.

The interaction that we have between universities is nothing compared to what it was in the 50s and 60s. I think that needs to be restored, because that's a comparative advantage. And almost no other universities have the experience and extension that we have. That's what made America great. Not what happened at the institution, but the extension that convinced a local farmer this is what makes sense, this is why it makes sense, and here's how you do it.

PMJ: *Could you speak to what the constituency for this type of aid is like in Congress, and how it's changed from your time in being in Congress, for providing global agricultural assistance?*

Bereuter: Today, I think, although it would be tough for some farm state Congressmen or Senators to say this, we don't need to have the level of crop subsidies that we do. If you have water, and you have good farmland, you're making more money than you ever have in your life right now because the commodity prices have gone up so much.

However, I think it would be an easier sell if you said okay, we're going to reduce or eliminate that particular subsidy if the Europeans disarmed accordingly. These subsidies have been driven by competition between the European Union and the United States on export markets. The United States would cut back on certain things and then we'd say, yeah but we're losing third country markets. The farm state Congressmen and every Senator who has some farming in his state would be concerned about the Europeans taking us out of markets in North Africa by their subsidies. …

I would say to farm state legislators: Make the point that what you're going to do with some of the things you're taking out of crop subsidies is to reinvest it in agriculture and agribusiness research at our state universities. Target it to those schools that really have the expertise. You are helping those farmers with increasingly good technology... You have that product then delivered to the developing countries, and you'd be able to produce more, pull them out of poverty to a greater extent, and meet their food demands.

PMJ: *I'd like to switch gears a bit and talk about Congress itself. Mann and Ornstein point to 1978 as being a watershed year in Congress, with Newt Gingrich as the catalyst. What do you think are the major differences between when you first came to Congress and when you left?*

Bereuter: There's been a very significant transition since I began to serve. It has become much more polarized, and partisan warfare is more extreme today. When I came to Congress, I thought two-thirds of the members could theoretically be members of either party, in terms of their political interests. There was a large political center you could work with, and perhaps one sixth on each end that were far to the right or left. Now it seems down to one third or less in the center, because Blue Dog Democrats and moderate Republicans have been successfully targeted for defeat.

One notable thing that happened [around] 1978 is that C-SPAN began to record the proceedings. Democrats controlled the majority in the House for forty straight years, and 1978 was toward the end of that forty-year period. Gingrich recognized, more than anyone else, that at the end of the day you could request a five-minute special order, or an hour, and it was an opportunity to make a case against the majority on the floor. And hour-by-hour, you began to make the time before the camera more partisan. At one point, Tip O'Neill became so upset about these speeches being broadcast to the country that he directed the cameras to be focused to show how empty the chambers were.

It has become much more politically polarized, and it is seen as politically disadvantageous, especially on the Republican side, to compromise. I recall a markup in the foreign affairs committee where all the Republicans decided they would walk out, because of some abuse of power that they perceived. But we were at a crucial point on a bill, and I just said, I'm not going with you. So I sat there and kept offering amendments, and the Democrats were perplexed, but they started supporting my amendments. That's just one anecdote, but it's a very different atmosphere today.

PMJ: *Obviously the institution has changed, and the debate is now around the causes. Is it gerrymandering? Is it the nationalization of campaigns? Is it because nobody drinks with each other any more, that members of Congress need to get together and socialize? What do you think?*

Bereuter: All of those things are contributing factors. Political gerrymandering has made many districts politically safe for Republicans only, or Democrats only. California epitomizes that. You've had three decades of very sophisticated political gerrymandering here, and it's had a huge impact on the body as a whole because we have fifty-three house members from California. That's the largest percentage of the House ever dominated by one state's members, and it's been this way for some time now. And there were times when California had only one or two Congressional seats that were potentially going to go either way, where once there were several competitive races. There were times when not a single incumbent congressmen standing for reelection was defeated.

Then you have the social issue. Members used to spend more time in DC. Now the travel and mobility is such that most members go home on the weekends. Our sons were three and six when I was elected, so we decided that to have any family life, they had to live in Washington during the school year with me and maybe go home during the summer…But Speaker Gingrich would say to newly elected members that they should leave their families in their districts, to keep their

Congressman Bereuter talks with PMJ staff. Photo by Keleigh Annau roots there. So gradually it moved to a Tuesday-Thursday workweek and now everybody goes home, they don't socialize.

Earlier we had family events on weekends if we were there. We knew our colleagues, we went to the movies together. Tip O'Neill and Bob Michael, the majority leader, would fight it out on the floor and then go play cards and have bourbon afterwards. I was friends with Dave Olbey, one of the most prickly Democrats in Congress. He's a friend of mine because we did Aspen Institute seminars together, so we got to know each other. We both had sons at the same high school, and we went to the school board and said "Get that asbestos off the roof!" That kind of interaction is now minimized. So those are all factors.

Beyond all that, you have these talk show hosts that make a living by entertainment and using the political agenda as a part of the entertainment. I listen to these people on the radio occasionally, whether it's Rush Limbaugh or Michael Savage. I'm not surprised that people in the country are more split on issues than ever before, and why they think anybody from the other party is an enemy, if not a Communist or a Socialist.

PMJ: *Do you think it's going to get better?*

Bereuter: It's hard to see how it can. It will take citizen reaction for it to change. It will take things like California did, to open primaries and use a non-partisan reapportionment and redistricting commission. I think those are two initiatives you would never get out of the parties here. Over time, that would make a difference. I knew two people who ran for Senate in this state that I thought were admirable public servants and smart as could be: Ed Shao and Tom Campbell. They couldn't get through the Republican primary. They ought to have been elected, but it didn't happen because of the partisanship within the party itself.

PMJ: *So what advice do you have for some of us who would consider running for public office in the future?*

Bereuter: Money has become far, far too important. I couldn't have been elected under the current situation with [the] Citizens United [decision]. Money needs to be far less important in the way we ferret out people who are going to run, or not be able to run effectively. I was outspent in the primary and the general election, but we overcame it by being smarter and working harder… If you think you might be interested in being involved in a race, nonpartisan or partisan, you will be welcomed with open arms… I was sitting here working for the Department of Housing and Urban Development as my first job after the army. I boldly asked someone who was running for governor, "Can I write some position papers for you?" And they gave me a whole list of things they wanted me to do, and eventually they asked me to get involved in the campaign.

So there's plenty of opportunity. The question is, can you find the kind of support without selling your soul to raise enough money? For me, I just worked the district really hard. Thirty-seven round trips a year, for twenty-six years, because I avoided having a strong opponent. I did that by hard work, and rejected most of the PAC money that would have come my way, because I felt that it came with too many strings attached (or implied strings). It used to be that the party would help you financially with your races, but now members are expected to give dramatic amounts of money, depending on your position in the House. I ended up having a quota of perhaps $140,000 of campaign money each time I had to contribute.

PMJ: *Do you feel like if you were still in Congress you'd be able to say no? Would you be in a position to reject that money?*

Bereuter: I think so. But that's as a strong incumbent.

PMJ: *Do you have any parting words for us on global food supply, politics, or anything else?*

Bereuter: I feel very strongly that we cannot be complacent and hope for the best in the future. There are already too many people suffering from malnutrition. And it's going to be much worse unless we, in a concerted fashion, use public and private resources and national bilateral and international lending institutions and development institutions' funds to address it. So that's why I feel that we need to sustain the effort that's begun.

Our recommendations about launching a global agriculture initiative, which were substantial coming out of the Chicago Council, were given to the McCain and Obama campaigns in time to get it into the Republican platform committees of the two conventions. We thought that was a way to go, and we made an effort to make it bipartisan or nonpartisan in its advice. Obama's presidential transition team picked it up from the Chicago Council, and they felt comfortable and motivated to launch his Feed the Future initiative. But we started with the idea of making sure it moved regardless of who got elected president. I feel strongly that we need to sustain the good effort that started.

Scarcity Pricing and Saltwater Intrusion

A Tragedy of the Commons Threatens Central Coast Groundwater

JEAN SPENCER
EDITED BY LEONARDO COVIS AND EMILY VAUGHAN

California's Central Coast groundwater use is governed by a loose configuration of state and local laws. Under the current system, landowners have no incentive to limit how much they pump from groundwater under their land, and there is little oversight for how landowners use that water. As a rivalrous public good, one landowner's water use can negatively impact her neighbors, in particular through saltwater intrusion. When too much water is pumped from coastal aquifers, sea water can encroach, causing salinization. This paper discusses the current legal situation and examines options for mitigating the over-pumping, including tiered or progressively increasing water rates.

INTRODUCTION

Saltwater intrusion is creating a "tragedy of the commons" on California's Central Coast, a region of extremely productive irrigated farmland. At the beginning of the twentieth century, the Central Coast benefitted from abundant groundwater. However, excess pumping of freshwater, known as overdrafting, has led to saltwater intrusion, which diminishes both water quality and the holding capacity of local aquifers, threatening the productivity of the region's farmland.

This paper looks at how two adjacent water districts have tackled the problem. The Pajaro Valley Water Management Agency (PVWMA) and the Monterey County Water Resources Agency (MCWRA), which includes the Salinas Valley, share many of the same challenges. Both are located in agricultural regions with growing urban populations, both face saltwater intrusion due to overdrafting, and both have been threated with adjudication by the state due to poor groundwater management. Critically, water managers in the two districts must also operate within the framework of California water law, which provides few tools for managing the state's finite supply of groundwater. Despite these similarities, differences in local geography, culture, management style, and available resources have caused these two agencies to adopt different strategies for managing saltwater intrusion. While both have made progress, neither has completely solved the problem.

WHAT IS THE PROBLEM?

Hydrologic, informational, legal, and economic factors all contribute to saltwater intrusion, resulting in a situation where farmers have insufficient incentive to reduce their groundwater use.

The Hydrologic Problem

Due to its higher mineral content, saltwater is denser and heavier than freshwater. In coastal areas where freshwater aquifers come in contact with the ocean, saltwater intrusion is a threat because as water is drawn out of the aquifer, the remaining water has less mass and is under less pressure, so saltwater pushes in. The more freshwater is pumped out, the farther into the aquifer the seawater intrudes. Sea level rise due to climate change exacerbates this problem.

The Information Problem

Farmers in both valleys have traditionally resisted making their water use public, making it difficult to control saltwater intrusion. The MCWRA installed meters in the 1990s but pulled them out after farmers sued.[1] Today, Salinas Valley growers submit information about their water use to the MCWRA on a voluntary basis. While the PVWMA has successfully installed meters, farmers remain reluctant to disclose how many acres a given well serves. Water managers, therefore, consistently face a lack of information about how much water has been pumped from a given well or the amount of land the water has been applied to.

The Legal Problems

There are numerous legal barriers to sustainable management of California's groundwater. While the state has permitting authority over surface waters—lakes, rivers, and streams—and can limit the amount of water withdrawn by individual users, it does not have the same authority over groundwater except under very particular circumstances.[2] Since the aquifers that provide roughly 80 percent of the Central Coast's water do not meet these requirements, they fall under the California Correlative Rights Doctrine.

The following is a brief overview of the legal doctrines that affect groundwater use in the Pajaro and Salinas Valleys.

The Correlative Rights Doctrine

Under the Correlative Rights Doctrine, landowners whose property overlies an aquifer each have an equal and unrestricted right to put the groundwater to any reasonable and beneficial use as long as the basin remains in surplus. If the groundwater becomes overdrafted, one or more of the affected parties, the State Water Resources Control Board (SWRCB), or the court can file a suit requesting adjudication.[3]

During the adjudication process, hydrologists study the basin to determine how much water can be sustainably withdrawn per year. The court then divides that quantity proportionally among rights-holders based on their prior use and appoints a watermaster to oversee the basin's management. In some cases, adjudicated rights are transferrable and may be traded or sold.[4] Since adjudication is basically "a lawsuit against every single person in the basin,"[5] each user has an incentive to "lawyer up" to secure the largest possible allocation. The result is a long, difficult, and expensive process that most basins try to avoid.

Bulletin 118-80 and the Agency Acts

In the absence of state-level permitting authority, localities have adopted a patchwork of different strategies to manage groundwater, including creating local agencies, adopting local government ordinances, and pursuing court adjudications.[6] Both the PVMA and MCWRA have established local agencies to manage groundwater. However, their bylaws differ, as each was established in response to local conditions.

In Pajaro, the PVMA may only levy assessments to purchase, capture, store, or distribute supplemental water.[7] Conservation is notably absent from this list and can only be supported with money from the general fund. The bylaws of the MCWRA, on the other hand, do not prohibit assessment money from being used for conservation. [8]

Proposition 218

In 1996, California voters passed Proposition 218, "The Right to Vote on Taxes Act." Its passage was a devastating blow for water agencies, some of which lost half of their budgets overnight.[9]

The framers of Proposition 218 intended to make it more difficult for local governments to raise revenue through fees and assessments, targeting monthly fees for services such as water, garbage collection, sewers, and storm water management.[10] Proposition 218 stipulates that fees cannot be used for projects that provide a "special benefit" to land and buildings rather to than the general public. Instead, "special benefit" projects have to be funded by assessments that: a) do not exceed the amount of the special benefit; b) are proportional to the benefit each landowner receives; and c) receive at least 50 percent of the proportionally weighted votes of affected users. This process makes it exceedingly difficult, time consuming, and expensive for local entities to raise revenue for critical services.

The Economic Problem

Central Coast groundwater is what economists call a common-pool resource. It is non-excludable, in that there are no effective restrictions on the amount of water that landowners overlying an aquifer can pump. But it is rivalrous, meaning that if Farmer A pumps too much groundwater, Farmer B will end up with saltwater in his well. Without restrictions—and without a price that reflects water's scarcity—the end of abundant groundwater is a consequence of a classic "tragedy of the commons." Although everyone knows that the resource is finite, farmers are tempted to free-ride on each other, hoping that their neighbors will conserve while they continue to profit from overdrafting.

In the past, the only price that farmers paid for groundwater was the cost of drilling a well, installing a pump, and paying the electricity bill. As groundwater became depleted, that electricity bill got larger, since more energy was needed to pump water from greater depths. Over the past ten years, the price has risen even higher, as both the PVMA and MCWRA have charged pumpers additional assessments to bring in supplemental water to recharge the aquifer. However, even at these relatively high rates, water users still do not have enough economic incentive to conserve on the scale that is needed to restore the aquifer to health. Demand still exceeds sustainable supply.

TACKLING THE PROBLEM: A TALE OF TWO AGENCIES

Both the Pajaro and Salinas Valleys have adopted a variety of technical strategies to combat saltwater intrusion, including wastewater recycling, recharge, diversion, stormwater capture, and the provision of replacement water for those nearest the coast. An analysis of the technical aspects of these programs is beyond the scope of this paper. Rather, I will focus on the means by which each agency has raised the revenue necessary to implement these projects. In this respect, the two agencies have diverged substantially, although Proposition 218 has firmly shaped the strategies they have employed.

The central difference between the two basins is that PVWMA has successfully installed meters on all large wells, and it now charges by the acre-foot for pumped groundwater. Volumetric flat rates have a number of benefits. They are relatively simple to implement, proportional to usage, and provide some motivation to conserve. That said, there are notable quirks in the way that Pajaro installed its meters. For one, while farmers agreed to the meters, they did not agree to divulge how many acres each meter serves. Moreover, some farms draw water from more than one well. So, even though the agency knows how many acre-feet have been pumped from a given well, it does not know the number of acres of farmland that were irrigated with that water. Further complicating the picture is the fact that only 60 percent of wells serve a single farm; the remaining 40 percent are shared by more than one user. Farmers who share a well develop an informal system for splitting the bill, but the water agency is not privy to those negotiations and does not have information on who is using how much water.[11]

The MCWRA, by contrast, has been unable to meter groundwater. It has had to find another way to assess the proportional benefits each parcel receives from water augmentation projects in order to fulfill Proposition 218 requirements. The agency used two criteria to determine the benefit: 1) whether the land was being actively or passively used and 2) the proportional water supply and flood control benefits it would receive from the new projects. Land use was weighted on a zero-to-one scale, with residential, commercial, industrial, and irrigated agricultural use given a weight of one, while vacant lots, dry farms, and grazing land received the lowest weight, 0.01. The agency then multiplied the weighted use by the number of acres in a parcel to determine the "equivalent acreage," which it then used in the assessment rate formula.

The agency weighted the benefits accruing from the projects on a one-to-three scale. Those parcels that received benefits from flood control and the management of saltwater intrusion were weighted highest, at three, while benefits such as recharge, drought protection, and recreation received a weight of one. The agency then divided its service area into subareas, with each receiving a score based on how much benefit it would receive from each of the three projects. MCWRA then multiplied this score by the parcel's equivalent acreage to determine the assessment rate.[12] The final result was an assessment that ranged from $4.00 to $24.00 per irrigated acre.[13] The central benefit of Monterey's weighted rate plan is that it meets the proportionality requirements of Proposition 218. However, since property owners with the same land use in a given subarea pay the same fee regardless of how much water they pump, they have no economic incentive to conserve.

Alternatives

This paper considers four alternative solutions to the saltwater intrusion problem: let present trends continue; tiered rates; progressively increasing rates; and adjudication with transferable water rights. I judge each alternative by the following criteria: legality under Proposition 218 and the Agency Acts; economic efficiency; cultural fit; retention of local control; and equity for those who took steps to conserve in the past.

Alternative 1: Let Present Trends Continue

If present trends continue, Pajaro will need to build several new supplemental water projects in the relatively near term. While Monterey has tentatively stopped the increase in saltwater intrusion with its latest projects, over the slightly longer term it will also need to find additional ways to recharge the aquifer. Both agencies are planning new 218 elections: Pajaro to fund new projects and Monterey to pay for the environmental monitoring required for the last round of projects that was not included in the original budget.[14] Fees can be expected to rise unevenly over time to cover the costs of large capital projects to secure supplemental water. The agencies will need to hold new 218 elections to approve each round of increases.

Criterion 1: Legality

No legal difficulties are anticipated in either basin as long as every election follows 218 guidelines. Both agencies have won legal challenges to their current rate systems.

Criterion 2: Economic Efficiency

Pajaro: The PVWMA has put in place the fundamental building blocks of an economically efficient system with its volumetric rates. However, the fact that the basin is still not in balance shows that the Pajaro Valley has a ways to go before it becomes economically efficient.

Monterey: The Monterey County system is not efficient because users do not face a per-unit charge on their water use, and therefore have no economic incentive to conserve.

Criterion 3: Cultural Fit

While there has been grumbling—and lawsuits—in both districts about rate increases, the current systems have been formed in response to the local culture and thus have a fairly high degree of cultural fit.

Criterion 4: Local Control

The current plans allow for local control through the water agencies, which both seek a great deal of stakeholder input. However, the state has threatened to take over if the local agencies cannot bring the basins into balance.

Criterion 5: Equity

Pajaro: The Pajaro rate system is reasonably equitable, but since water rates do not reflect the true price of water given its scarcity, those who over-pump do not face the full cost of their usage.

Monterey: The Monterey system is geographically equitable in that customers pay more if the region in which their land is located receives more benefit. The agency has also attempted to make the system more equitable by differentiating between types of land use. However, because it does not measure individual water use, no one is held accountable for excessive pumping that threatens the sustainability of the aquifer.

Alternative 2: Tiered Water Rates

Tiered water rates increase progressively with consumption. For example, there might be one rate for the first acre-foot of water used, a higher price for the second acre-foot, and an even higher price for the third. Under a tiered rate structure, an agency would need to decide whether to apply different rates depending on the type of crop grown. Apples, for example, require less water than lettuce. If the agencies implement uniform rates, they will impact what crops are economical to grow on the Central Coast. However, applying multiple tiered rate systems would be complex to implement.[15]

Regardless of what type of tiered rate system an agency chooses, it would need to have two pieces of information: the amount of water used by each customer and the number of acres to which the water was applied. Because farms vary in size, agencies need to know how many acres a given volume of water is serving in order to institute tiered rates equitably. For example, suppose Farmer A has ten acres of land and is profligate with water, while Farmer B owns one hundred acres and uses every conservation method available. If tiered rates are based solely on the quantity of water used, Farmer A might remain inside the first tier while Farmer B might be penalized with a much higher rate. Per-acre water rates allow agencies to make tiered rates fair and consistent for differently sized farms.

In addition to their relative complexity, tiered rates raise several other problems. In a region where most of the rain comes between November and April and the highest water usage months are in the fall, tiered rates could cause revenue shortages for the agency in the first year in which they are implemented, because most users will not reach the top tier until the fourth quarter.[16] Tiered rates could also run afoul of some of the agencies' bylaws because of the additional revenue they would eventually raise. Some have proposed using that revenue to fund conservation efforts, as has been done in other states. In Pajaro, however, assessments cannot be used for conservation.

Criterion 1: Legality

While tiered rates should be possible under Proposition 218, it may be necessary to change some of the bylaws in the Agency Acts in order to implement them successfully. Pajaro would need to hold an election to allow additional funds to be used for conservation.

Criterion 2: Economic Efficiency

Tiered rates hold promise as a means to encourage users to conserve water by charging higher prices to those who use more. In practice, however, they have led to mixed results. Frequently, public pressure and lobbying have caused agencies to set rates sub-optimally. The first tier is often applied to too large a quantity, and the price is not always increased sufficiently between tiers to incentivize efficiency. Furthermore, in the Pajaro Valley, some farmers have more than one well serving their property, which could allow them to game the system by trading off between wells to keep from reaching the highest tiers.[17]

Criterion 3: Cultural Fit

Because of traditional resistance to disclosing information about water use, neither Pajaro nor Monterey currently has the information it would need to implement tiered rates.

Criterion 4: Local Control

Tiered rates would allow local agencies to continue to manage the water supply. If this system resulted in increased conservation, it might improve local control by making it less likely that the basin is taken over by the state.

Criterion 5: Equity

If tiered rates were implemented optimally, they would increase equity by charging a higher price to those who put more of a strain on the sustainability of the basin. Tiered rates would also reward those who previously took steps to conserve water.

Alternative 3: Progressively Increasing Rates

The basic premise underlying progressively increasing rates is that when the price of water reflects its scarcity, demand will come into equilibrium with sustainable supply. With progressively increasing rates, voters would have to agree in a 218 election to rates that increase by a certain percentage above the inflation index every year until the basin reaches a predetermined equilibrium. The agencies could decide in advance whether equilibrium means stopping new seawater intrusion or pushing saltwater back out of the aquifer. When the basin reaches the previously agreed-upon equilibrium, the rate increases stop. If, at a later date, saltwater intrusion again becomes a problem, the rate increases automatically begin again and continue until equilibrium is restored. In Pajaro, the rates would be based on volumetric usage, while in Monterey the rates would follow the proportional allocation that the agency has already implemented. The revenue generated by increasing rates could be used for conservation efforts, securing supplemental water, and providing incentives to those who build private catchment systems to recharge the aquifer with run-off.

Criterion 1: Legality

Progressively increasing rates face similar legal challenges to tiered rates. Pajaro would need to hold an election to allow the additional funds to be used for conservation and incentives for recharge.

Criterion 2: Economic Efficiency

Progressively increasing rates would improve economic efficiency by allowing agencies to find the price at which demand equals sustainable supply. According to the model used in the Bureau of Reclamation's Incentive Pricing Handbook, Pajaro would need to charge between $300 and $450 per acre-foot to meet its current conservation goal of 5,000 acre-feet per year.[18] How high the price would need to go would depend on the elasticity, or responsiveness to price, of agricultural water use. According to the Bureau of Reclamation, agricultural water use is not very elastic; the Bureau assumes a short-run elasticity of 0.1 to 0.2. What this means is that for every one-percent increase in price, users will reduce use by only 0.1% to 0.2%.

In the long run, however, it is likely that water use is more elastic than indicated above. If farmers think that high prices are temporary—due to a drought, for example—they may make no changes to their operations. However, if they believe that high prices are permanent, they may begin to invest in systems that allow them to conserve water. To provide just one example of a conservation strategy, Pajaro has looked into tensiometer systems that measure soil conditions and send out a digital stream of information in real time. Farmers can use those data to apply precisely as much water as is needed, thereby conserving water without compromising yield.[19] Anecdotal evidence also supports the idea that water use is more elastic over the long run. In an interview, one industry professional noted:

> When I looked at data from other states, when agencies switched to tiered pricing, district revenues went up significantly because landowners couldn't figure out how to conserve right away. So the districts set up a fund to help farmers with conservation efforts. Very quickly, farmers adopted conservation, water use fell, and the district revenue went back down to where it had been before.[20]

It is reasonable to suppose that the price responsiveness observed under tiered rate programs would also take effect under the progressively increasing rate system.

Criterion 3: Cultural Fit

While there is no question that progressively increasing rates would be a tough sell to voters, this strategy has an important advantage over tiered rates: agencies don't need to know how much water an individual uses or how many acres it is applied to. While using meters is preferable, the strategy could still be used in a district like Monterey, where customers oppose meters.

Criterion 4: Local Control

Progressively increasing rates would allow water management to remain in the control of local agencies. Some control would be lost, however, due to the automatic nature of the price increases.

Criterion 5: Equity

Progressively increasing rates would be more equitable under Pajaro's current rate system than that of Monterey, since the land-based augmentation fee does nothing to prevent free riding. In Pajaro, however, those who previously instituted conservation on their land would be rewarded with lower bills.

Alternative 4: Adjudication with Transferable Water Rights

As mentioned above, under adjudication, hydrologists conduct a hydrological study of the water basin to determine the amount of water that can be sustainably pumped per year. The court then allocates water in proportion to historic use among those who have water rights. A court-appointed watermaster oversees the basin to make sure that everyone remains in compliance. A variation of adjudication makes allocated water rates transferrable, meaning that they can be bought and sold in an open water market.

Criterion 1: Legality

Adjudication is legal under current law and has been performed in several water basins in the state of California, creating an established precedent.

Criterion 2: Economic Efficiency

Adjudication is simultaneously the most and the least economically efficient choice. Once the adjudication is settled and done, it is a very efficient strategy. The amount of water that can be withdrawn is clear, as is the allocation to which each user is entitled. Since allocations can be bought and sold, there is more incentive for water to be put to its most socially beneficial use. The loss in economic efficiency under adjudication lies in the time and legal fees spent wrangling over the details before the decision is final.

Criterion 3: Cultural Fit

Adjudication would be a bitter pill to swallow for most residents of the Central Coast. Not only would they have to reveal all of the details of their water usage, they would also lose control of water management to the courts.

Criterion 4: Local Control

Adjudication would result in a loss of local control.

Criterion 5: Equity

The adjudication process provides some equity gains because it would end the free-riding problem. However, since adjudication allocates water rights proportional to historic use, it would reward those who were historically profligate and punish those who had conserved in the past.

RECOMMENDATION

A system of progressively increasing water rates would provide the best mix of efficiency and acceptability of the strategies outlined above. Politically, it would be a hard sell. No one likes to pay higher rates, and convincing water users that doing so is in their long-term best interest would take some salesmanship. At the same time, water users face some very real and unpleasant alternatives that might make progressively increasing rates more palatable. Securing supplemental water under the business-as-usual scenario, especially in Pajaro, will require ever-more expensive projects that ratepayers will be on the hook for. Furthermore, if the basin is not brought into balance, the state will adjudicate, a prospect that is extremely unpleasant for most Central Coast water customers. Progressively increasing water rates provide a way for water agencies to incentivize conservation through prices that account for scarcity, while at the same time providing the agencies with revenue that can be used to help farmers conserve. If the Central Coast is to continue to serve as "the salad bowl" of the nation, water use must be brought into balance with future supply. Progressively increasing water rates are one way to regain equilibrium and ensure sustainability in the water basin while respecting local norms and maintaining local control.

Table 1. Matrix of Alternatives
Highest rating: + + + +. Where Pajaro and Monterey would experience different outcomes, two ratings are shown.

Alternative	Legality	Efficiency	Cultural Fit	Local Control	Equity
Let Present Trends Continue	+ + + +	+ + (P) + (M)	+ + +	+ + + +	+ + + (P) + (M)
Tiered Rates	+ +	+ + +	+	+ + + +	+ + +
Progressively Increasing Rates	+ +	+ + + +	+++	+ + +	+ + + + (P) ++ (M)
Adjudication with Transferable Water Rights	+ + + +	+ + +	+	+	+ +

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A Race to the Bottom
The Unintended Impacts of State Tax Incentives

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State politicians have a long tradition of offering targeted tax incentives to large firms, in exchange for firms' agreement to locate job-creating capital projects in their state. However, when multiple states compete with one another for a particular capital project on the basis of tax incentive packages, firms may be able to use their superior bargaining position to drive the state's expected economic return to zero—or below. This article explores how multiple market failures—including a collective action problem among the states, principal-agent problems in politics, and discrepancies in information and bargaining power—can encourage states to offer overly generous tax incentives to firms, violating constituents' best interests and undermining economic development goals.

America's federalist system gives rise to the challenge of balancing state sovereignty with potential harm from competition among the states. Targeted state tax incentives—whereby states grant broad tax exemptions in return for a firm's agreement to locate a job-creating capital project within the state—provide an especially interesting example of negative interstate competition. The rising competition between states in the latter part of the twentieth century on the basis of tax incentive packages inspires the need for economic evaluation of these onerous expenditures. This evolution is especially critical when states such as California suffer from alarming debt, while losing an estimated $5 billion in revenue to business tax incentives alone.[1]

HISTORY OF STATE TAX INCENTIVES

While tax incentives have played a role in state and local government practice since the American Revolution,[2] modern state tax incentives began in 1936, when Mississippi pioneered the use of tax-exempt bonds to attract industrial projects.[3] Maine introduced the first business development corporation in 1949, and New Hampshire created the first industrial finance authority in 1955.[4] By the early 1960s, similar vehicles were present in approximately 20 states.[5] By the 1980s and 90s, tax incentives were ubiquitous across the states, inspiring a "war between the states"[6] with an "arms race" mentality.[7]

The marked growth of state tax incentives in the past several decades can be explained by two major factors. First, businesses became far more mobile as the dominance of tangible property faded and intellectual property came to represent a greater portion of business value. America transitioned from an industrial, agrarian society, whereby most business value was tied to the land and could not be moved without considerable cost and effort, to a service economy, whereby business value became increasingly encapsulated in easily movable human capital and intellectual property. This allowed companies greater freedom to relocate in order to take advantage of favorable incentives offered in other jurisdictions.[8] Second, as soon as one jurisdiction adopted highly favorable tax treatment for big business, businesses with mobile operations could threaten other states with abandonment unless those favorable tax treatments were matched locally. This threat set the stage for an "arms race" toward a point where each state was maximally "armed" with as many tax incentives as it could feasibly provide.[9]

LITTLE GAINED FROM TAX INCENTIVES

The growth of state tax incentives for business coincided with a decrease in state business tax revenue. Corporate income taxes accounted for 9.4 percent of total state revenues in 1981, but fell to only 5 percent of revenue in 2002.[10] Moreover, corporate tax revenues as a share of reported corporate profits declined from 6.6 percent to 4.0 percent from 1980 to 2000.[11] Of course, numerous changes in the political environment may have contributed to these trends. However, Peter Fisher isolates the effect of targeted incentives by investigating incentives in 20 manufacturing states, which together account for 75 percent of the nation's manufacturing output. He finds that in the absence of incentives, the effective corporate income tax would have fallen from 4.9 percent to 4.4 percent from 1990 to 1998. Incentives contributed an additional 1.3 percentage points to the decline in the effective corporate income tax rate, setting it at 3.1 percent. Thus, Fisher finds a decrease of 29.4 percent attributable to incentives.[12]

The results of targeted tax incentives are widely bemoaned in scholarly literature.[13] As Douglas Watson states in his book *The New Civil War: Government Competition for Economic Development:*

> Numerous studies have demonstrated that incentives, such as tax free bonds, have little effect on the location of industries. While the original purpose of industrial development bonds was to attract industry to poorer regions, all states now offer similar incentives, so a competitive edge for any one locality is not likely over an extended period.[14]

In other words, if every state offers equivalent incentives, then industries receive a windfall regardless of location, and will choose a location based on other factors.[15] In this situation, states relinquish significant amounts of tax money without garnering appreciable benefit. For example, one study found that North Carolina lost $147,463 per job created in the state via incentives.[16] Although state tax incentives might be tremendously effective if only one state were to enact them, they are generally ineffective when multiple states have equivalent incentives.

WHY DO STATES COMPETE?

Given the potentially negative impact of state tax incentives, it stands to reason that states would serve their interests by avoiding competition with one another. Nonetheless, states compete for several key reasons. First, politicians are under tremendous political pressure to create jobs. Good jobs are the "holy grail" of local politics because they raise the standard of living and create societal stability.[17] Moreover, no state politician wants to be blamed for inaction when a major employer leaves the state in response to favorable tax incentives elsewhere. Politicians may find it difficult to successfully convey that an incentive package designed to retain the largest businesses in the state would have been unjustifiably expensive. This local pressure inspires competition for job-creating corporate projects that can be attracted to a jurisdiction through targeted incentives.

Second, many economic development projects cannot be shared across jurisdictions. A corporation will bring the benefits of its capital investment primarily to a single state. As Ann Bowman explained in *Competition for Economic Development among Southeastern Cities*,

> By virtue of their existence, jurisdictions are self-interested entities. Competition is said to occur when benefits are returned to a subset of the jurisdictions seeking them. Cooperation is precluded by the single fact that it leads to no joint gains. Self-interest dictates competitive behavior.[18]

Third, the federalist structure of American government establishes the states as sovereigns, free to set tax policy as desired. States have traditionally had free rein to provide subsidies, including tax incentives, to businesses that invest and operate within the state.[19] The Commerce Clause of the United States Constitution limits state competition: states are forbidden from interfering with interstate commerce by imposing greater tax burdens on out-of-state transactions and businesses than in-state ones.[20] Nonetheless, courts have routinely found that there was no "substantial federal question" involved when interpreting tax breaks provided through incentive packages.[21]

In 2006, state tax incentives were challenged in the courts under the Commerce Clause in *DaimlerChrysler Corp. v. Cuno.*[22] In that case, the Sixth Circuit had found that Ohio's investment tax credit, granting $280 million in tax credits to build an assembly plant, violated the Commerce Clause by coercing business located in Ohio to expand locally, thus interfering with interstate commerce.[23] However, the Supreme Court resolved the case by determining that the taxpayers who brought suit did not have standing because they could not demonstrate that their taxes were raised or services cut. The taxpayers could not demonstrate that the long-term goal of job creation through the incentives would not counterbalance the short-term cost.[24] Therefore, the case was dismissed without arriving at any conclusion about the relation between the Commerce Clause and state tax incentives. *DaimlerChrysler* continued the courts' traditional lenience in allowing states the freedom to grant targeted state tax incentives. Though it did not make an official ruling on the Commerce Clause issue itself, the Supreme Court's rejection of lawsuits from individual taxpayers has effectively allowed state incentives to continue unregulated, since business and states have no cause to bring suit themselves.

Thus, states compete because of largely unchecked sovereignty, self-interested pursuit of economic gains that cannot be shared, and continuous political pressure to create and retain quality jobs by any means possible.

COLLECTIVE ACTION PROBLEM

By combining the conclusions of the previous two sections, we see that states are pushed to compete for business development with tax incentives, but that these tax incentives provide little return on investment where there are equivalent tax incentives available in multiple states. State-to-state competition for business development—and the resulting downward pressure on returns on investment from incentives—sets the stage for a collective action problem. States would all be better off individually if none offered tax incentives, but each state would face a tremendous motivation to cheat on a cooperative agreement to disallow such incentives. This situation is the embodiment of the classic prisoner's dilemma, wherein all parties would benefit if all cooperated, but each party stands to gain from being the sole non-cooperator. The rational result of a prisoner's dilemma when each actor's decisions are unregulated is universal non-cooperation because cheating always brings a better result.

Governors were able to agree at the 1993 Annual Governors Association meeting that "states will always be in competition with each other for business investments. However, this competition should not be characterized by how much direct assistance a state can provide to individual companies."[25] Despite this agreement by the governors in principle, no progress has been made toward cooperative agreements since 1993. Any unilateral or small-group movement toward a system without targeted incentives would leave participating states at a disadvantage in their ability to attract industry.[26] In 1991, Connecticut, New York, and New Jersey agreed not to offer tax incentives that would lure companies away from one another. New Jersey violated this voluntary agreement within a year, and it was roundly ignored within three years.[27]

THE MARKET FOR TAX INCENTIVES

With no agreement among the states to limit targeted tax incentives, and federal oversight dismissed in favor of state sovereignty, the "market" for state tax incentives can be conceived of as a competitive free market. In that market, state leaders are largely at liberty to offer tax incentives in any amount acceptable to their constituencies.[28] The level of competition among states determines the extent of tax incentives offered for each capital project.

The market for tax incentives operates as any other free economic market operates: the equilibrium "price" for firms' capital investment will be set where the marginal benefit to the state equals marginal cost of providing the incentive package. The cost is comprised of both foregone tax revenues and subsidies granted by the state to secure the firm's investment. The benefits include everything that the state stands to gain from firms' investment, including tax revenues and spillover benefits that arise from the capital project. The creation of quality jobs has inherent societal benefits, including increasing living standards, providing job skills that increase the state's stock of human capital, ensuring stability of an employed population, and providing a long-term boost to productivity and resources via capital investment. A rational state representative should include any gains to the state—direct or indirect, short- or long-term—that follow from a large capital project when considering the benefits it would create.

The market reaches equilibrium because states bid against each other on the basis of price by enhancing their incentive package offers. If several states are approximately equally well suited to host the capital project, such that costs and benefits are similar across these states, then these states will bid until the point where expected costs equal their expected benefits.[29] Therefore, the result of a properly functioning market for tax incentives is that the winning state receives zero net economic gain from the incentive package it offers.

However, this theory of zero gain assumes an efficient market that produces the optimal outcome when parties interact without regulation or restrictions. In fact, the market for business development projects is characterized by numerous economic inefficiencies that suggest that the expected outcome will not be realized—and that actual returns to states from targeted tax incentives may be negative.

FAILURES IN THE MARKET FOR STATE TAX INCENTIVES

Information Differences

In the market for tax incentives, there may be a significant information imbalance between firms seeking tax incentives and states offering them. While the impact of tax incentives may be relatively easy for tax professionals at a major corporation to assess, the benefits of economic development for a state are difficult to quantify; they often involve long-range considerations, the outcome of which is subject to significant risk and uncertainty. For example, it is difficult to predict how much outside capital investment would be required to create a noticeable boom within a local economy. In spite of the difficulty of quantifying expected benefits, state leaders seldom request economic studies of incentives offered.[30] Political leaders have little to gain from potentially embarrassing long-term studies of tax incentives provided for development that has already occurred.[31] One study found that "states do not conduct regular or meaningful reviews of the programs to determine whether they are producing the anticipated economic outcomes."[32] This lack of information about the effectiveness of past programs may leave states at a significant informational disadvantage relative to corporations.

As a result of the sometimes-willful limitation of information about tax incentive programs, media are restricted in their ability to hold the government accountable for results.[33] Media cannot report objective studies if such studies do not exist, and most media sources do not have the ability to conduct such reviews alone. By deliberately remaining in the dark about the long-term ramifications of tax incentive programs, state leaders also keep the media in the dark. The result is that media coverage of tax incentives is often anecdotal rather than analytical, and the media have little evidence to contradict claims that incentive efforts that fall short of expectations do so because of macroeconomic shifts, market forces, or corporate greed and dysfunction.[34]

Principal Agent Issues

As discussed above, politicians face constant pressure to appear to be proactive job creators.[35] The announcement of a large capital project can give a significant popularity boost to a local politician. This interest, separate from and possibly conflicting with the best interests of the state, creates a principal-agent problem, whereby politicians do not act as reasonable agents for the state.[36] According to Watson,

> The competition for economic development has become so intense, and the stakes so politically important, there has been little rational discussion about alternative approaches to growth and recovery. Even though many concerns have been raised about these tax incentives in the past, there appears to be an escalation in the type and size of incentives offered by state and local governments in recent years.[37]

This principal-agent problem reduces efficiency by introducing considerations for the decision-maker that are outside of the economic interests of the state.

Enforcement Problems

Another source of inefficiency is the ability of companies to secure incentives after they have already committed to job creation.[38] Tax incentive packages are often designed to be limited to a subset of companies that create a certain number of new jobs. However, those designs may be imperfect. In some cases, an in-state candidate company already has strong local ties that would make moving impractical, such that they would expand production within the state whether tax incentives were offered or not. Furthermore, candidate companies may have already committed to expanding production within the state, but not yet created the jobs that qualify for the new credit.[39] This concern is supported by significant evidence in the literature suggesting that business tax incentives have little actual effect on the location decisions of firms, and instead represent a windfall to firms.[40] . In both cases, the result is the same: the state incurs no economic benefit from granting tax incentives that induce no new job creation.

Agreements also suffer from questions of accountability. A firm may not follow through on its commitment and obligation to create new jobs. Several states have developed reporting requirements on job creation and "clawback" programs to recoup incentive money when jobs are not created as promised, but such monitoring remains difficult.[41] States may be at an information disadvantage as to the number of jobs actually created, and enforcement efforts can potentially impose large costs. There are no analogous measuring and monitoring costs for the firm; the costs of enforcing the agreement fall upon states.

Bargaining Power Discrepancies

Finally, there may be a significant gap in negotiation capabilities between state employees and company executives. Large corporations stand to benefit from training employees to identify, evaluate, and negotiate for tax incentive opportunities around the world, but state employees may have little or no training in negotiation tactics. This training and education gap may produce results that strongly favor the firm during the negotiation process.

The public attention garnered by major capital projects may also increase firms' bargaining power relative to that of states. The media announcement of a particular planned investment project often inspires a frenzy of excitement: the public is keenly interested in the economic benefits that such a project could bring to the local economy.[42]

This spurs a competition among state politicians to attract the capital project—but this competition is one-sided. It is a market with many would-be "buyers" (states that are interested in the capital project), but just one "seller" (the company). In this way, the market for a particular capital investment project is analogous to a monopolistic market, and firms may be able to exploit this monopoly-like position in the bargaining process.

Because major investment projects and large firm relocations are relatively rare occurrences, state leaders experience intense political pressure when such opportunities and incidents arise. Of course, bidding for capital projects does not occur in a vacuum: a state could certainly forego any one project in favor of a future project. But in light of the extreme political ramifications and media interest, the gains and losses from each such negotiation are keenly felt. For example, it would be of little solace to the state of Washington that it could bid on a future capital project if homegrown Boeing were to move all of its manufacturing out of the state in order to garner better tax incentives elsewhere.

In the presence of firms' bargaining power advantage, the "zero net gain" expected in the context of a competitive market for tax incentives will not hold. Instead, monopoly-like power will allow firms to take advantage of multiple market failures and inefficiencies, such that the "winning" bid of tax incentives is likely to result in negative economic value for the state that offers it.

A Case Study in Failure: Mercedes in Alabama

Alabama's bid for a manufacturing plant of Mercedes sports utility vehicles in the early 1990s provides an illustrative case study.[43] Mercedes announced in April 1993 that it would build a manufacturing plant in the United States. This announcement sparked a frenzy of competition between thirty states; the group of competitors eventually narrowed to North Carolina, South Carolina, Georgia, Tennessee, Mississippi, and Alabama.[44] Each state offered its own tax incentive package, requiring most, including Alabama, to call a special legislative session for review.[45] In a display of power, Mercedes required governors of each state to travel to Germany to present their state's package.[46]

Ultimately, Alabama won the bidding with an incentive package valued at over $250 million, and called a press conference encouraging statewide celebration. The state's policymakers paid $75,000 to post a Mercedes logo at a University of Alabama football game to announce the accomplishment, demonstrating that they placed great political importance on the negotiations.[47] The Alabama Development Office urged cities, counties, and schools to buy Mercedes vehicles in appreciation of the deal.[48] The announcement immediately soured General Motors, a longtime Alabama manufacturer, which begrudged the celebrity given to Mercedes but withheld from a loyal local business.[49]

Word was soon released that Alabama had committed to buying 2,500 Mercedes SUVs during the negotiation process, but had omitted mention of this provision in its public announcement. The additional $75 million commitment was also excluded from analysis released to the press. Furthermore, the commitment apparently violated laws requiring the purchase of American cars for public purposes and a bidding process for any purchase over $5,000.[50] Alabama had been bamboozled into making an offer unmatched by its competitors and in apparent violation of state law.

It was later revealed that Alabama agreed to pay 1,500 workers for their first year of training at a total cost of $45 million. This was a provision that all other competing states had immediately refused to agree to based on its cost, yet Alabama reported this simply as "paying for training period."[51]

The industrial incentives law agreed upon in the negotiation was poorly crafted. The law allowed Mercedes to collect 5 percent of wages that would have gone toward state income tax from its factory workers. However, because of miscalculations, Mercedes deducted more than the workers would have paid in state income tax, and the program cost Alabama an additional $42.6 million. Furthermore, the law as crafted also applied to other expansion projects that Mercedes had already committed to, giving out further incentive where no additional inducement was needed.[52]

Smaller gaffes continued to stream out about the agreement. The governor agreed to use a luxury Mercedes SUV as his official car outside of the bidding process, but had no way to pay for it.[53] Negotiators agreed to rename the highway from Birmingham to Tuscaloosa in honor of Mercedes.[54] Resistance grew in the state legislature because Mercedes would not agree to hire a certain percentage of minorities in their factory operations.[55] Although this project clearly suffered in part due to poor political management, it also accords with expectations in the context of large firms' monopoly-like bargaining power and the inefficiencies predicted to result therefrom. The Alabama government clearly believed that the acquisition of the Mercedes manufacturing plant would be a major political coup. Mercedes was able to use bargaining power to pit states against one another in the negotiation process, and exploit poor state knowledge to receive provisions that only Alabama was willing to give. The tax incentive programs were drawn too broadly and applied where the company had already committed to expansion, causing Alabama to forego tax revenues without receiving further economic benefit.

The result was a very costly incentive package for Alabamans, up to one hundred million dollars greater than the closest offer when all expenditures were counted. Ten years later, Mercedes had met its commitment to create 1,500 jobs in Vance, Alabama, but the resulting impacts on regional growth and development were inconclusive. Vance still did not have a restaurant or grocery store; most workers chose to commute from Tuscaloosa or Birmingham.[56] Although Mercedes did follow through on job creation, it seems unlikely that the desired economic multiplier effect from the project was realized.

EVALUATION

The results of state-provided tax incentives are disquieting. State governments cannot claim that tax incentives are simply "new money" foregone, rather than an actual reduction in taxes. The 29.4 percent reduction in the corporate income tax rate during the 1990s suggests that this is not true.[57] Even if the capital project employs many unemployed or underemployed workers, or uses underutilized resources—and even if there are no other, more productive alternative investment opportunities—some of the resources used in the capital project may have been creating positive tax revenue in their previous use.[58] In other words, the opportunity cost of a large capital project is rarely zero. The tax revenue generated through state incentives must exceed both the cost of the incentives and the opportunity cost of tax revenues. According to an economic analysis framework that acknowledges market failures, states may be expected to fall short of this tax mark by a wide margin. The case of Alabama and Mercedes exemplifies such failure.

Equity Considerations

Although this paper has focused primarily on the negative consequences of targeted tax incentives from an efficiency standpoint, there are also serious equity concerns. The result of large firms' bargaining advantage over states is both horizontally and vertically inequitable.[59] It is horizontally inequitable because firms that promise to create new jobs are able to negotiate a lower tax burden than firms of equal size that are long-time, stable employers within a state. This gives those firms a competitive advantage. It is vertically inequitable because large, well-established firms that are able to command the attention of politicians and the media can negotiate lower tax rates than small firms. The result is a regressive system of corporate taxation that favors large firms with existing market power.[60] In essence, targeted state tax incentives allow large corporations to increase their profitability through cost reduction, made possible by higher taxes levied on small businesses and taxpayers.

RECOMMENDATIONS

Solutions to mitigate the economic harm caused by state tax incentives must confront the difficulties of the collective action problem. Federal regulation is the most straightforward solution, taking advantage of the supremacy of federal law over state law to enforce binding rules. Federal law is limited to specific areas under clauses that grant the federal government authority, of which the Interstate Commerce Clause is the most expansive. The implications to interstate commerce of state tax incentives are clear: large, mobile corporations able to reduce costs and gain a competitive advantage at the expense of state residents and existing firms. Although the Supreme Court has been unwilling to address Commerce Clause issues in tax-incentive-related cases brought by taxpayers, the generally liberal interpretation of Congress's Commerce Clause powers suggests that direct legislation on targeted state tax incentives may be constitutional.[61] . In other words, even if the Supreme Court has signaled that it is unwilling to invalidate practices challenged under current law, it remains possible that Congress could legislate to change the law within constitutional parameters.

An alternative to federal regulation would be a binding and enforceable agreement among the fifty states to resolve the collective action problem. The crucial component of such an agreement would be an enforcement provision, designed to deter states from "cheating" in their own self-interest by establishing appropriate sanctions for violating the agreement. The short-lived pact between Connecticut, New York, and New Jersey—which broke down after a single violation—clearly demonstrates that such contracts need an enforcement mechanism in order to succeed. Although convincing states to place limits on their future use of targeted tax incentives may initially prove difficult, legislators could use the World Trade Organization as an example of how an enforcement mechanism could serve the mutual interests of sovereign states.[62] A binding and enforceable contract would curb politicians' temptation to offer inefficiently large tax breaks to firms.

Competition among the states is inevitable, but it need not spark a race to the bottom that deprives states of the benefits from business growth and development. Instead, federal regulation or an enforceable agreement among states to limit targeted state tax incentives could require states to compete by creating an environment that is conducive to business—whether large or small, old or new.[63] Universal, non-targeted, lower taxes could then be used to finance quality services, infrastructure, and education that would benefit society as a whole, rather than disproportionately benefiting large, powerful corporations. Limiting competition on the basis of tax incentives would result in a more equitable and efficient distribution of the gains from local economic development and business growth.

CONCLUSION

If the market for tax incentives operated flawlessly, then a straightforward economic analysis would predict that states pay exactly as much in tax incentives as they expect to receive in direct and indirect benefits from firms' investment. However, there are several reasons to believe that market failures favor large firms over states during negotiations over incentive packages. Principal-agent problems, high enforcement costs, and differences in information and bargaining power conspire to allow companies to exploit the negotiations procedure, saddling states with tax promises whose economic benefits do not merit their high costs. Without a resolution to the collective action problem faced by states, the practice of competing over large capital projects will continue to violate taxpayers' best interests and undermine states' economic development goals.

Daniel Baker

ENDNOTES

[1] Michael I. Luger and Suho Bae, "The Effectiveness of State Business Tax Incentive Programs: The Case of North Carolina," Economic Development Quarterly 19 (2005): 13.

[2] Terry F. Buss, "The Effect of State Tax Incentives on Economic Growth and Firm Location Decisions: An Overview of the Literature," Economic Development Quarterly 15 (2001): 90, 91.

[3] Idem.

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[5] Buss, "The Effect of State Tax Incentives," 91.

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[7] David Brunori, State Tax Policy: A Political Perspective (Washington DC: The Urban Institute Press, 1995, 2d ed.), 31.

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[12] Ibid. (citing Peter S. Fisher, "Tax Incentives and the Disappearing State Corporation Income Tax," State Tax Notes 23, no. 9 (March 4, 2002), 767-74).

[13] Brunori, 31.

[14] Watson, 5 (citing William Greider, The Education of David Stockman and Other Americans, New York: E. P. Dutton, 1981), 12.

[15] See also Brunori, 35.

[16] Luger, 337-38.

[17] Brunori, 28-29.

[18] Ann O'M. Bowman, "Competition for Economic Development among Southeastern Cities," Urban Affairs Quarterly 23, no. 4 (June 1988), 511.

[19] Brunori, 27.

[20] Ibid.

[21] Watson, 17.

[22] DaimlerChrysler Corp. v. Cuno, 547 U.S. 332 (2006).

[23] DaimlerChrysler Corp v. Cuno, 386 F.3d 738 (6th Cir. 2004).

[24] DaimlerChrysler Corp. v. Cuno, 547 U.S. 332, 333-34 (2006).

[25] Watson, 59 (quoting Gary Kerr, "Governors Want to Ease Bidding Wars," Montgomery Advertiser, September 17, 1993, 2B).

[26] Brunori, 36.

[27] Ibid.

[28] As discussed later in this paper, the public is likely to lack sufficient information to provide proper oversight.

[29] If the states are not equally well suited to host planned investments—for example, by virtue of special natural resource endowments, geographic position, or human capital advantages—then the incentive packages should differ by exactly the value of the difference between the states. In a well functioning market, this could result in a small gain to the state that is best suited to host the project.

[30] Buss, 93.

[31] Ibid.

[32] Brunori, 34.

[33] See Ibid.

[34] Buss, supra note 2 at 92.

[35] Brunori, 28-29.

[36] Luger, 327.

[37] Watson, 7.

[38] Brunori, 32. ("Another criticism of targeted tax incentives is that they are generally offered to companies that would have undertaken the desired investment in any case.")

[39] See Watson, 74. (Hanna Steel Corporation benefited from the new industrial incentives law after already committing to a $30 million expansion before the law was created.)

[40] Ibid., 5.

[41] Brunori, 33-34.

[42] See Watson, 67.

[43] Watson, 67-80.

[44] Ibid., 67.

[45] Ibid., 68.

[46] Ibid.. at 70.

[47] Ibid., 71.

[48] Ibid., 72.

[49] Ibid., 73.

[50] Ibid.

[51] Ibid., 74-76.

[52] Ibid., 74.

[53] Ibid., 74-75.

[54] Ibid., 75.

[55] Ibid., 76-77.

[56] "Ten Years after Mercedes, Alabama Town Still Pans for Gold," Savannah Morning News, accessed at http://savannahnow.com/stories/100902/LOCSWEET.shtml.

[57] See Ibid., 20.

[58] Buss, 92-93, gives criteria to economically justify public investments).

[59] Brunori, 32-33.

[60] Ibid., 30, 33.

[61] It is beyond the scope of this paper to analyze extensive Commerce Clause case law in search of a proper legislative basis for federal regulation, but given that Congress has limited local incentives with the Tax Reform Act of 1986, it is likely that a law could be fashioned to limit targeted state tax incentives.

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GENDER EQUALITY:
THE CASE FOR A GLOBAL PUBLIC GOOD

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Global public goods (GPGs) share the economic characteristics of conventional public goods, but rather than being confined to a specific population or locality, the benefits of GPGs are experienced by multiple nations, peoples, and generations. International organizations are increasingly adopting the GPG framework—both as a means for prioritizing particular agenda items, and to inform their approach to delivering globally beneficial services. However, gender issues have been conspicuously absent from the GPG discussion to date. This article demonstrates that gender equality shares the qualities of a GPG and suggests how the GPG framework can be leveraged to understand the many benefits of realizing gender equality at a global scale. Policymakers should adopt and promote gender equality as a GPG in the context of the post-2015 United Nations Development Agenda.

INTRODUCTION

Many development challenges transcend national borders and cannot be suitably solved by one country acting alone. Examples include climate change, cross-border health threats, spread of financial crisis, and natural resource scarcity. Economists have coined the term "global public goods" (GPGs) to characterize the solutions to such challenges. The concept of "good" in this context is not synonymous with "merchandise," but rather signifies a tangible or intangible thing that confers benefits or utility. Like other public goods, once produced, GPGs are available to everyone (they are "non-excludable") and do not diminish in quantity with additional users (they are "non-rival"). However, GPGs are distinct from other public goods because their welfare-enhancing effects are not confined to a single country or locality. Instead, they produce positive spillover effects that cross borders, benefiting multiple populations and generations. However, like other public goods, conventional economic markets will under-produce GPGs because their benefits are not fully "owned" by a single group of economic actors.

For the past decade, major international organizations such as the United Nations and the World Bank have spurred multilateral action to overcome the under-provision of GPGs. It is quite striking, however, that the subject of gender has largely been missing from the ongoing reflection on GPGs. As noted by Blacken, the concept of gender is "notably absent from virtually all of the literature on GPGs."[1] More fundamentally, gender equality has never been a candidate for inclusion in the list of internationally recognized GPGs. Gender equality refers to the equal rights, responsibilities, and opportunities of women and men. It does not entail that women and men are the same in all respects, but rather that their respective rights and opportunities do not depend on whether they were born male or female. In addition to being recognized as a human rights issue, there is mounting evidence that gender equality is also a precondition for sustainable development.

The exclusion of gender equality in the GPG framework prompts a number of interrelated questions. First, to what extent does gender equality display the characteristics of a GPG? Second, does framing gender equality in terms of a GPG shed new light on the appropriate policies to overcome persisting inequalities between men and women internationally? Finally, what are the prospects for solving such a global challenge in the post-2015 United Nations Development Agenda?

This paper builds on research on gender equality and GPGs to define gender equality as a GPG. I start by briefly outlining the GPG framework and its policy implications in international cooperation. I go on to show that at the national level, gender equality is a non-rival good that can be rendered non-excludable by policies. At the global level, I argue that gender equality is a fundamental complementary public good: its attainment is a necessary condition for the provision of other GPGs. The positive externalities associated with gender equality are twofold: those arising from so-called "role model effects," and those stemming from "multiplier effects." Framing gender equality as a GPG should help overturn the stubborn misconception of gender equality as a "zero-sum game" whereby women's gain of utility is exactly balanced by men's loss of utility, or vice versa. I conclude with a discussion of international policy options for the promotion of gender equality in the post-2015 agenda.

CONCEPTUAL FOUNDATIONS

THE GLOBAL PUBLIC GOOD FRAMEWORK

A GPG is first and foremost a public good, as originally defined by Samuelson: "a good which all enjoy in common in the sense that each individual's consumption of such a good leads to no subtraction from any other individual's consumption of that good."[2] Samuelson's definition puts forward two criteria. First, the benefits should be non-rival in consumption, whereby consumption or use by one person does not diminish the amount of the good available to others (although this does not preclude some users from benefiting more than others from the good).[3] Second, the benefits must also be non-excludable; in other words, once the good is produced, no one can be costlessly barred from enjoying its benefits. There are actually very few pure public goods (examples include: air, national defense, and information). In practice, many goods that we think of as "public" are impure public goods, as neither characteristic (non-rivalry or non-excludability) may be exhibited completely. In this paper, I use the term "public good" broadly to encompass quasi-public goods, or goods with significant positive externalities, such as education or health services.

Although a distinction can be made between public goods and externalities in theory, the practical distinction is limited. Externalities are costs or benefits that result from an economic activity that affects a party not involved in the transaction.[4] A common example is a vaccination against disease. An individual who receives vaccination against a disease is consuming a private good. However, in reducing the risk of disease for the individual, the vaccination also confers a positive externality to society, because the risk of contagion is reduced for all members of the community. This externality provides a public good: reduced risk of disease. Thus, in practice, positive externalities often signal the existence of a public good.[5]

In Kaul's seminal definition, the key distinction between a global public good and a national public good is that the benefits of a GPG should, in principle, be available to all throughout the globe.[6] According to Morrissey, however, this is a demanding, and perhaps unduly restrictive requirement.[7] He argues that a more useful criterion is that GPGs must have a "spillover range" across borders, continents, or generations. In other words, a core feature of GPGs lies in the fact that their positive effects are not confined to one country.

According to traditional economic theory, the private market produces fewer public goods than is socially desirable, constituting one of the foremost examples of market failure. For each individual economic agent, it is rational to leave the production of public goods to others, and to enjoy the benefits for free. Because of this "free rider" problem, governments often represent collective interest by providing public goods, but face significant coordination problems in determining the quantity to supply. When a public good is global rather than local or national, this free-ridership problem is compounded, as governments have incentive to free ride as well. Despite the proliferation of intergovernmental bodies with strong convening power and the increased interconnectedness of populations around the world, decision-making at the global level remains extremely challenging. Furthermore, international bodies do not, themselves, internalize the positive spillover effects resulting from the provision of GPGs. The consequence is continued under-provision of GPGs.

Defining gender equality

Since the adoption of the Beijing Platform for Action in 1995, there is a growing international consensus that gender equality is not only a fundamental human rights issue, but also a necessary condition for achieving sustainable development. In many respects, gender equality is a necessary condition that must precede the work toward other development objectives.

It is necessary to clearly distinguish between gender equity and gender equality. Gender equity is fairness of process to women and men, whereas gender equality refers to fairness in the outcome of this process. Given the persistent gender gap across and within regions, a world where gender equality has been fully achieved is still difficult to envision.[8] It would be a world in which gender-based violence, and disparities in access to health services, educational and career opportunities, and political participation have been eliminated in all countries. To ensure fairness, measures must often be taken to compensate for historical and social disadvantages that prevent women from operating on a level playing field with men. Progress toward gender equality requires changes within the family, culture, politics, and economic and legal structures.

One prevailing strategy to reverse imbalances is to empower women. For empowerment to be realized, women must have equal capabilities (in terms of education and health), equal access to resources (such as land) and opportunities (such as jobs), and above all the agency to use these capabilities and resources to make decisions.[9] While empowerment is a very context-specific, bottom-up process that no intervention can immediately "produce" or "deliver," it is incumbent upon the state and international community to provide the enabling factors and conditions that support the empowerment process.[10] The state, for instance, should provide women with a safe and formal judicial system and prosecute gender-based violence. It should also ensure that programs or policies foster women's participation in political systems at all levels, provide funding for activities that raise awareness of gender issues, and promote women's decision-making power in economic structures.

GPGS IN THE INTERNATIONAL DEVELOPMENT AGENDA

GAINING MOMENTUM

GPGs are increasingly gaining attention in the international community for two main reasons. First, a series of environmental and financial crises has heightened awareness of the interconnectedness between countries and the powerful spillover effects of domestic policies. Second, rapid economic growth rates and progress on development goals in many regions raise questions about the continued relevance of traditional international cooperation and aid mechanisms: some proponents of reform advocate for refocusing the mandate of international organizations, particularly the World Bank, away from the role of lender to developing countries and toward the provision of GPGs.[11] Another such pioneering effort was the decision of the UK Department for International Development (DFID) to create a distinct funding category for international public goods, outside of its official development assistance.

PROVIDING GPGs: THE NEED FOR LEADERSHIP AND IMPROVED COORDINATION

Three major factors are required to supply GPGs and avoid the problem of free ridership that commonly plagues public goods: effective international institutions, adequate financing, and responsible leadership. In this regard, some of the necessary conditions for the provision of gender equality are already in place, such as a normative framework and an institutional structure. The weakest link, however, lies in the lack of commitment and leadership. Part of this leadership deficiency may be because most global leaders are men, who may be reluctant to change the status quo.

The normative framework underpinning the objective of reaching equal opportunities and rights for women has grown over the years. The United Nations Convention on the Elimination of All Discrimination against Women (CEDAW), adopted in 1979, is regarded as the Bill of Rights for women. It contains crucial commitments by the member states' parties who pledged to "take in all fields…all appropriate measures… to ensure the full development and advancement of women," to "encourage women's participation in decision-making processes and public life," and to enable them to represent their countries at the international level.[12] Over ninety percent of the member states of the United Nations—185 countries—are party to the convention. Yet, more than three decades later, global enactment of this message is far from achieved.

The institutional framework to initiate, advocate, and coordinate interventions geared toward the attainment of gender equality is also in place. This structure is essentially a long-term process requiring a sustained engagement within institutions, often over decades.[13] There is a plethora of intergovernmental agencies whose mandates cover gender equality and women's empowerment, including the UN Special Rapporteur on Violence against Women, the Technical Commission on the Status of Women, the Office of the Special Adviser on Gender Issues and Advancement of Women, and the United Nations Entity for Gender Equality and the Empowerment of Women (UN Women). In addition, the UN entities, the World Bank, the OECD, the bilateral aid agencies, and most governments, have an office, bureau, division, or ministry in charge of advancing gender equality and women's empowerment. However, this complex institutional landscape is symptomatic of the challenging coordination problems that arise in the attempt to provide a GPG. The creation of UN Women, which was officially launched in February of 2011 by merging several UN agencies, is a positive step toward resolving some of the coordination challenges.[14]

LINKING GENDER EQUALITY AND PUBLIC GOODS

WOMEN'S EMPOWERMENT AND THE PRODUCTION OF PUBLIC GOODS

Enhancing women's capabilities affects both the demand and the supply of other important public goods and partial public goods, such as education, potable water, and health services. Thus, along with knowledge and governance, gender equality is what Morrissey calls a "complementary public good."[15] Morrissey specifies that for these activities "it is the enhanced capacity that constitutes the public good, not necessarily the goods that may be produced as a result."[16]

On the demand side, by redressing the power imbalance between men and women, gender equity increases women's demand for other public goods. Morrissey argues that the poor (the majority of whom are women) are least likely to benefit from public goods such as education, financial stability, or healthcare, because they experience information asymmetries due to their disadvantaged economic and social status.[17] The process of empowerment, which can take the form of increased mobility or literacy, enhances women's access to these goods. Other empowerment mechanisms, such as increased participation and enhanced voice in the public sphere, can induce women to demand more of these public goods. In his paper on equity and justice, Rao confirms that distributive justice significantly influences the demand for public goods, which is the product of a social bargain among citizens, and between citizens and the state.[18] He points out that existing inequalities are key determinants in how citizens voice their claims, and whether these claims are heard.

On the supply side, evidence is growing that when women are in decision-making positions, they tend to favor the provision of public goods to a much larger extent than their male counterparts. Duflo and Topalova examined the impact of the presence of women in Indian village councils (panchayat) on the provision of local public goods.[19] The panchayat is a system of local administration responsible for the management of local public goods, such as drinking water schemes and improvement projects. Since the 73rd amendment to the Indian constitution, one-third of the seats on all such councils are randomly selected each term to be reserved for women. Taking advantage of this randomization, Duflo and Topalova compared the quantity and quality of public goods in two sets of villages. The analysis showed that villages with female leaders experienced greater public good investment, and the measured quality of these goods was at least as high as in non-female-led villages.[20]

Defining gender equality

Contrary to conventional wisdom, gender equality is not simply a "women's issue." Gender equality is non-rival: the enjoyment of equal rights by women does not diminish men's enjoyment of the same rights. Nor is excludable, as by definition men cannot be prevented from enjoying the benefit of equality. In his reflection on the link between gender equality and public goods, Blacken argues that only in an ideal world of resource abundance would gender equality be both non-rival and non-excludable—and thus not a "zero-sum game," whereby men "lose" and women "win."[21] However, this is a conflation of gender equity and women's empowerment with gender equality. While empowering women may require a reallocation of resources, the outcome of gender equality had benefits for both men and women.

Mounting evidence stemming from sociology, feminist economics, and development studies indicates that men are also oppressed by patriarchies and rigid gendered norms of masculinity.[22] For example, in a comparative study on men and parental leave in the United States, Kimmel found that when men told their supervisors that they wanted to take paternity leave, they were seen as uncommitted to their careers. By contrast, the Nordic countries' visionary policies to involve men in family life treat questions of "work-life balance" not as "women's issues" but as family issues. Before the institution of "Daddy days," only 20 percent of Swedish men took parental leave; now over 90 percent do, and these men report being better off.[23]

Second, socially constructed norms of masculinity, such as "men don't get sick" or "men are tough" may have negative consequences on men's health. In many cultures it is seen as a sign of weakness for men to be tested for HIV; men are at particular risk of infection because social norms prevent them from seeking help.[24] Gender equality, as a status of equal opportunity and rights, is enjoyable by all—men and women alike. In a gender-equal society, women would have just as much opportunity as men to become CEOs, and men would have just as much opportunity as women to become "stay-at-home" parents if they aspire to do so.

Furthermore, there is growing evidence that gender equality will lead to economic growth for all. According to economic theories of human capital (in particular, the work of Gary Becker), if women's work is undervalued due to gender discrimination in labor markets, companies that hire women should enjoy a higher return than that of competing firms.[25] Several recent studies have attempted to measure the impact of female membership in the board of directors on company performance.[26] A Catalyst study found that companies with more women than average on their boards outperformed their rivals, garnering a 42 percent higher return on sales and 53 percent higher return on equity.[27] Among other benefits of women's participation in corporate governance, studies have shown that a gender-balanced board is more likely to pay attention to managing and controlling risk (European Commission 2012).

Transposing the Keynesian concept of the economic multiplier effect to the microeconomic level provides a clear picture of the benefits of gender equality in the household realm. The multiplier effect refers to a series of re-investments that follow a single initial economic investment, the sum of which is much greater than the initial impetus. A growing body of empirical and theoretical literature suggests that women are likely to use and invest household resources in ways that improve family well-being—in particular, the well-being of children—to a larger extent than men do.[28] Many poverty alleviation programs rely on this finding, specifically targeting women as transfer recipients. A recent systematic review of 15 impact evaluations tackled the following question: "What is the evidence of the impact on family well-being of giving economic resources to women relative to the impact of giving them to men?"[29] The review focused on unearned transfers (including microcredit, grants, and unconditional cash transfers) and covered, among others areas, South Africa, Mexico, Bolivia, Pakistan, and Bangladesh. Differences in outcomes from transfers to women versus men were found in all but two of the studies. There is significant evidence that cash transfers given to women in the household rather than men improve child nutrition and health, and thus the long-run physical wellbeing and economic prospects of household members.

GENDER EQUALITY: A GLOBAL PUBLIC GOOD

In order for gender equality to qualify as GPG under Kaul and Morrissey's framework, the spillover effects from equality must extend beyond national borders. Given the scarcity of empirical research on cross-border positive externalities of gender equality, this section lays out two main concepts that warrant further exploration. First, gender equality is a necessary condition that must precede the work towards the provision of other GPGs, and a condition that catalyzes the positive effects of these other GPGs. Second, gender equality's positive externalities at the international level stem from so-called "demonstration effects," whereby the behavior of female politicians and activists may be emulated by other women, impelling greater female participation in the public sphere.

Gender equality and the other millenium development goals

The eight Millennium Development Goals (MGDs) have underpinned most of the economic development agenda for the past decade, spanning from the eradication of extreme poverty to reducing child mortality to ensuring environmental sustainability. The goals were agreed upon by all members of the United Nations in 2000, and since then have formed a blueprint for bilateral and multilateral development interventions. Achieving gender equality and the empowerment of women is itself a MDG (MDG3), but it is also a condition for the achievement of most other MDGs. I explore this idea with regard to the two goals that can readily be defined as GPGs: ensuring environmental sustainability (MDG7) and combating HIV/AIDS and malaria (MDG6).

Regarding MDG7, there is mounting evidence for the gender dimensions of climate change, and the need to incorporate women's empowerment in climate adaptation strategies.[30] To take one example, studies show that women's role in the preservation of biodiversity is paramount. In many countries women are primarily responsible for agricultural activities, seed storage, and plant conservation for cooking and medicinal use.[31] However, women often have very limited decision-making power over agricultural outputs. Several authors suggest that addressing gender imbalances in natural resource management could make a significant contribution to preserving ecosystems.[32]

Gender equality also has a catalyzing role in the fight against HIV/AIDS (MDG6) through various channels. Apart from the deleterious effect of rigid norms of masculinity on HIV/AIDS prevalence as mentioned above, there is a strong correlation between HIV/AIDS and other aspects of gender inequality. Several systematic reviews show that when women are denied access to sexual and reproductive health information and services, they are considerably more vulnerable to HIV.[33] In a recent study, the Organization for Economic Cooperation and Development found that the prevalence of HIV in the population aged fifteen to twenty-four years is greater in countries where women have few rights in terms of inheritance and parental authority, and where polygamy is prevalent.[34]

Political engagement and demonstration effects

Women's participation in political decision-making is both a manifestation of increased gender equity and a necessary condition for gender equality. Empirical work at the national level on the "role model effect" or "demonstration effect" suggests that, under certain conditions, the presence of female political candidates has a positive effect on political engagement among adult women[35] and young adolescent girls.[36] The presence of stateswomen can undermine the endemic conception that women are unfit for public responsibilities; it can also trigger increased interest in politics by women who anticipate that more gender-sensitive policies will be adopted.[37] The evidence of a "demonstration effect" exerted by women presidents, heads of government, directors of organizations, and CEOs of major companies in certain countries on female engagement remains anecdotal, and a systematic substantiation of this argument is beyond the scope of this paper. However, it is certainly plausible that such a mechanism could be at work in certain contexts.

The case of Rwanda provides an example. A decade after the Rwandan genocide, a constitutional mandate set aside 30 percent of parliamentary seats for women, enabling them to hold positions of public influence. At the first election, women gained fifteen more seats than the twenty-four seats reserved for them.[38] In the subsequent elections of 2008, women took 56 percent of contested seats in the legislative elections, making Rwanda the country with the most women in parliament.

A series of reforms promoted by the cross-party caucus, the Forum of Women Parliamentarians (FWRP), have had very positive effects on the country's prosperity.[39] In 2004, Rwanda adopted a National Land Policy with the goal of eliminating gender discrimination in the possession of land rights. Before the law was enacted, Rwandan custom reserved land ownership predominately for men. The law has tremendously increased women's sole and joint land ownership: As of March 2012, private land owned consists of 11 percent owned by women, 5 percent owned by men, and 84 percent owned by married couples.[40] The new land laws have paved the way for better access to financial services by women: since they are more likely to own land, women are better able to collateralize a loan with a bank.[41] Rwandan women's labor force participation rate is as high as 80 percent. They are active entrepreneurs: women are at the head of 42 percent of enterprises and in the informal sector they manage 58 percent of firms, which contribute to 30 percent of the country's GDP.[42]

Other positive effects on national welfare are readily visible. The national health budget, for example, rose from 3 percent in 1998 to 15 percent in 2010, which complies with the target set by the Millennium Development Goals.[43] Rwanda now has a "gender-disaggregated" budget: budget line items are scrutinized to ensure that both women and men benefit from public spending. The Rwandan experience has shown that a single motion that empowers women in the public sphere can have large, lasting, and positive effects.

POLICY IMPLICATIONS FOR THE POST-2015 DEVELOPMENT AGENDA

THE NEED FOR STRONGER EVIDENCE

The importance of evaluation and evidence in changing mindsets, fostering buy-in, and creating conditions for change is revealed by the evidenced-based policy movement that shapes the aid policy of most western countries. Public investment decisions are increasingly results-based, and in order to secure an appropriate level of funding, gender equality advocates need to further document and measure the widespread public benefits resulting from gender equality. However, gender-disaggregated data are still scarce and are rarely used to evaluate the contribution of women to development outcomes.

There is also a need to systematically conduct gender-sensitive evaluation of development interventions, as evidence regarding the impact of gender-specific interventions on gender equality remains insufficient. Several challenges have yet to be overcome. Chief among these is the need to develop specific and accurate indicators capable of capturing long-term changes in power and status, especially at the macro level.[44] As the first phase of the MDG effort is coming to a close, International Initiative for Impact Evaluation (3ie) and the World Bank's Independent Evaluation Group are undertaking major systematic reviews to assess the results of the gender and development agendas. Ideally these reviews will be rigorous and gender-sensitive, and the post-2015 agenda will be informed by the findings of this meta-analysis.

THE NEED FOR IMPROVED FINANCING AND COORDINATING MECHANISMS

While the focus of development policies is slowly switching from traditional aid to more consideration for global public goods, funding and decision mechanisms have so far remained largely unchanged in most international organizations. Official aid for country-based programs amounted to $120 billion in 2009[45], whereas only about $12 billion was dedicated to support the production of global public goods. Given this, the prospects of addressing these global challenges may rest, in part, on innovative collective financing mechanisms that would be specifically designed for GPGs and distinct from "development interventions." Some of the options under discussion are financial transaction taxes, mobilization of the International Monetary Fund Gold, or transportation levies.[46]

Managing such pressing collective action challenges at the global level requires some fundamental change in multilateral governance, partnerships, and planning structures. In this respect, a new window of opportunity is opening with the end of the first phase of MDG in 2015. UN Women is a strong potential champion for gender equality as a global public good. But delivering GPGs is a long-term process requiring the formation of complex, outcome-oriented partnerships with diverse stakeholders around the globe. A number of functions should be performed by the coordinating entity, such as monitoring and reporting country-level commitment to gender equality, as well as tracking the government's budget following the gender-disaggregated budgeting methodology.

THE NEED FOR A TRANSFORMATIVE AGENDA

As for any GPG, the question of incentives for change should be explored systematically. While ultimately a global society with gender equality will benefit everyone, transitional efforts to promote gender equity might be seen as hurting men's interests. This is purely because many interventions have so far left the gendered paradigm unchallenged, with narrow definitions of masculinity and femininity. Thus, the international community should adopt two key features in any gender-equality initiative: involving men and aiming for transformation. While both terms have been part of the development vernacular for several years, very few interventions actually take the transformation of oppressive gender norms seriously. Only when this happens would men have an incentive to promote gender equality.

The post-2015 Development Agenda is taking shape in a time of budget constraints, when only investments with significant positive economic effects will be placed on the policy agenda of donors and governments. Inscribing gender equality within the global public good paradigm is thus a particularly timely objective. Moreover, defining gender equality as a GPG provides a compelling framework through which to understand both the widespread benefits that flow from achieving equal rights by gender, but also the major obstacles to this achievement. Defining gender equality as a global public goods would spur a crucial paradigm shift in two respects: from mere altruism for the benefit of women alone, to provision of greater utility for all people; and from a dismissive characterization of gender equality as a "women's issue" to the true meaning of equality.

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GLOBAL POLICY

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Violent Drug Trafficking Organizations and the Link to Insurgency

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Mexico's drug conflict has spiraled into dangerous territory in recent years, due to the growth of multiple powerful cartels seeking to control the flow of drugs to the United States. This article explores alternative approaches to combating Mexican drug trafficking organizations through counter-insurgency tactics. It examines the ways in which Mexico's current situation mimics insurgencies elsewhere, as well as several important differences. It concludes with a set of policy options for the United States and Mexican governments to consider in their approach to combating these organizations and mitigating their influence.

INTRODUCTION

Mexican drug-trafficking operations have existed for years but have now morphed into what the RAND Corporation defines as violent drug-trafficking organizations (VDTOs). Mexican VDTOs produce, transship, and deliver tens of billions of dollars worth of narcotics annually into the United States.[1] These organizations do much more than just traffic drugs, they pose a severe threat to the Mexican government, though the exact nature of this threat has yet to be determined.

Some argue that the threat from VDTOs could be defined as an insurgency in that VDTOs are attempting to control the resources in Mexico through the use of irregular military forces and illegal organizations.[2] The Central Intelligence Agency defines *insurgency* as a "protracted political-military activity directed toward completely or partially controlling the resources of a country through the use of irregular military forces and illegal political organizations."[3] Insurgent activity includes guerilla warfare, terrorist tactics, and political mobilization in an attempt to weaken government control and legitimacy while increasing that of the insurgents. The purpose of this report is to use insurgency as a framework to analyze whether counterinsurgency (COIN) efforts can be successful in combating VDTO activities. The goal is not to determine whether or not the VDTOs constitute an insurgency or a hyper-organized crime network, but rather to explore an alternative analytical framework that may offer a new approach for combating these organizations.[4]

The expanding scope and increasing violence of VDTOs since 2006 suggests that new policies must be adopted to fight these organizations. Findings from a 2011 RAND report[5] suggest that these VDTO activities may exhibit characteristics of a proto-insurgency, or the primary phase of an insurgency, when compared to various cases of historical insurgencies with similar developmental traits. While VDTOs are not a full-blown insurgency today, their genesis, operations and ongoing support share many of the same characteristics of insurgencies. This paper uses an insurgency framework, defining the VDTOs as insurgents and the government as counter-insurgents, to illuminate new possible strategies to reduce the power and influence of VDTOs through a comprehensive intervention that looks beyond counternarcotics measures alone. It will analyze the rise of VDTOs, compare their relative strengths and weaknesses, and make suggestions for policy shifts in Mexico consistent with an insurgency framework.

ORIGINS AND CHARACTERISTICS OF THE INSURGENCY

Over the years, Mexico has earned its place in the drug-trafficking world, due to the increased production of illegal substances within its borders and the growing power of the cartels.[6] Mexican drug-trafficking organizations arose from law enforcement efforts to combat cocaine trafficking in Colombia. Eventually operations were moved from Columbia to Mexico, and beginning in the 1990s Mexican organizations took over the cocaine trafficking routes into the United States. Since the 1990s, these organizations have expanded to include other types of drug trafficking, including marijuana, heroin, and methamphetamines, as well as criminal activities like extortion, money laundering, and human trafficking. The country is now in a battle with powerful and well-financed drug cartels where drug, arms, and human trafficking and violence are entangled in the conflict. Today seven organizations are dominant in Mexico: the Sinaloa cartel, Tijuana (AFO), Juárez (CFO), the Beltrán Leyva Organization (BLO), Los Zetas, the Gulf Cartel, and La Familia Michoacana.[7] Alongside these cartels, three "enforcer" groups of organized assassins have arisen: the Cártel de Jalisco Nueva Generación—enforcers for the Sinaloa Cartel, La Resistencia— enforcers for Los Caballeros Templarios, and La Mano con Ojos— enforcers for the Beltrán Leyva.[8]

In 2006 Felipe Calderon was elected president and began a new drug enforcement campaign. He ordered massive raids on known drug cartel locations, increased the military's presence and role in combating violence, and "cleaned house" in state and local police forces, which often have ties with drug cartels. While aspects of Calderon's drug war policy were effective, his policy also provoked a violent response from the drug-trafficking organizations, whose operations were interrupted by government intervention. The violence grew, and since 2006 it has become more varied, atrocious, and often aimed at innocent civilians. In January 2012, the Mexican government reported that 47,515 people were killed in drug-related violence since President Felipe Calderón began his 2006 assault on criminal cartels.[9]

In July 2012, Mexico elected Enrique Peña Nieto as president, who has vowed to adopt a new drug war strategy. Nieto is a member of the Institutional Revolutionary Party, or Partido Revolucionario Institucional (PRI), the party that ruled Mexico for 71 years before losing power in 2000. Some believe that the PRI's less hard-line approach to the cartels will mean less violence in the future, but it remains to be seen how the Nieto administration will respond.[10]

The tactics that VDTOs use and the nature of their violence resemble the preliminary stages of an insurgency in many ways. Furthermore, many of the underlying societal conditions that often give rise to an insurgency are present in Mexico. The presence of these factors justifies use of the insurgency framework to analyze the VDTOs' operations, tactics, and motivations. By identifying the defining characteristics as well as the core principles of COIN doctrine, the operations and objectives of both the insurgents—VDTOs—and the counterinsurgents—the Mexican government—can be analyzed. By comparing the strengths and weaknesses of both groups, in reference to how their operations fall within the principles of insurgency or counterinsurgency, we can draw conclusions and make policy recommendations for the future of Mexico.

SIMILARITIES WITH INSURGENCY CHARACTERISTICS

Ability to gain territory

One characteristic of an insurgency is control over a particular land area and/or group of people.[11] Mexican drug-trafficking organizations engage in violent turf wars over key trafficking routes, ports of entry, and territory. They seek to gain control over the population in these areas and expand their spheres of influence and operations. Cartel leaders employ tactics to gain control of towns and local municipalities. They threaten mayors, governors, and local police chiefs until they are forced to allow the cartel operations in that area. Once they have control of an area, cartels can conduct operations without fear of law enforcement action. Drug violence is largely concentrated in areas of conflict between competing cartels.

Employ terrorist tactics

The VDTOs use gruesome violence against their enemies and terror tactics to instill fear in those who question their authority or challenge their operation. Some of the worst drug cartel turf fighting in Mexico occurs at a highway intersection between Monterrey, Nuevo Leon Reynosa, and Nuevo Laredo, the so-called Triangle of Death.[12] Mexican authorities have found mutilated bodies dumped along highways or in mass graves. Bodies are often found decapitated and missing limbs. In 2010, the National Human Rights Commission revealed that more than 11,300 migrants, most from Central America, had been kidnapped and either held for ransom or conscripted into criminal gangs in Mexico between April and September of that year. Kidnappings, extortion, and threatening of family members are also common activities. In his book *Drugs and Contemporary Warfare*, Paul Rexton Kan states that, "citizens can be caught in the dilemma of joining the wartime economy by participating in the drug trade or refusing, which jeopardizes the well-being of their families."[13]

Provide employment to civilians

Mexico has a free market economy with large industries including oil, motor vehicles, textiles, and agriculture. The unemployment rate is 5 percent for the entire population and 9.5 percent for ages 15-24. The underemployment rate may be as high as 25 percent.[14] Added to this is the fact that Mexico is a experiencing a "youth bulge." More than 25 percent of the Mexican population is between the ages of 15-24, on the cusp of entering the workforce.[15] When these young adults are not in school and not employed, they are in a position to be recruited by VDTOs. Compounding these challenges, the government loses legitimacy with the public when it cannot tackle issues such as unemployment, poverty or adequately provide public services. In contrast, VDTOs have been provided employment to many people. These organizations can pay much higher salaries than many legal occupations, as well as offering room for advancement and a sense of allegiance. In addition, they can often provide more money to police forces, often in the form of bribes, than their local or federal government salary. Thus the police can easily be "bought" and will work for the VDTOs under the guise of working for the government.

Do not engage in fighting they cannot win

VDTOs prefer to use terror tactics and avoid major military confrontations. When faced with military confrontation, they eschew conventional warfare for guerilla tactics. While these organizations have managed to accumulate a large number of advanced weapons and technologies over the years,[16] organizations try to only fight battles they know they can win. This is also important because each organization has key players who they cannot afford to lose in fighting. Organizations suffer greatly when they lose their leadership and thus seek to protect them, as any hierarchical organization does. However, the nature of their fighting is constantly evolving. As Gary Fleming states in his book *Drug Wars: Narco Warfare in the Twenty-First Century,*

> One disturbing shift in tactics came to light with the discovery of a booby-trapped body in a cartel safe house in Cancun in January 2008. Police responding to a report of a kidnapping were soon engaged in an extended gun battle with cartel members when the officers approached what turned out to be a safe house containing a cache of assault rifles and grenades. Once the suspects fled and the authorities began searching the house, police reported that the cartel members had pulled the pin on a fragmentation grenade and placed the grenade in the hand of a dead body. This incident has led to concerns that the cartels may increasingly shift to an insurgent-style campaign as security operations progress.[17]

Show evidence of a social/political movement

Most insurgencies are built on a political, economic, ethnic, and/or religious motivation. In the case of Mexico, VDTOs seem to be more concerned with their business interests versus a specific social or political cause. However, the danger is that the conditions exist for one or more of these organizations to take their activities into the realm of a social movement and quickly morph into a full-blown insurgency, especially if the government is unable to maintain security. With urban unrest, high unemployment, and other severe political problems, one could see how another political organization could possibly win over the population with the simple promise of change for Mexico. The VDTOs have shown little interest in this so far, perhaps because the government has not yet managed to substantially interrupt their activities. However, if organizations begin to feel increased pressure from the government and military and police forces, it is possible that they may develop some of the political aspects of an insurgency. The newly elected president has indicated that government policies toward the drug war will shift, but it remains to be seen if they will put greater pressure on the VDTOs. Finally, some preliminary indications of a social movement can be seen in Mexico. There are signs that Los Caballeros Templarios, the breakaway faction of La Familia Michoacana, is seeking to brand itself as a social movement, including the cartel's distribution of booklets in the region claiming it is fighting a war against poverty, tyranny and injustice.[18] In fact, La Familia Michoacana asserts a *Michoacanos* identity and publicly claims to combat threats posed by those from outside their state.[19]

WEAKNESSES OF THE INSURGENCY

Direct violence against innocent civilians and failure to establish a political agenda

VDTOs do aim attacks at police forces, military, and local government officials in towns where they need to gain or maintain control. However, the bulk of the violence affects civilians caught in the crossfire of different organizations' turf wars. Cartels have overrun many small towns that lie on trafficking routes. Many victims are Central American migrants trying to make their way through Mexico to the United States. Often they are forced to work for an organization or found dead in mass graves. VDTOs also regularly use extortion and kidnapping to threaten people and their families, souring relations between the people and these organizations. An insurgency fights, just as the government does, to win over the "hearts and minds" of the people. The population's support is the most important element of insurgent success.

If VDTOs hope to transform their operations into a true insurgency, they will have to work to win over the civilians they are distancing through terror and violence. This could be accomplished by providing for the population in areas where the government is failing, such as in education, employment, health, and security. VDTOs similarly may adopt an ideological element and become a social movement for change as a mechanism for toppling the government. Operations may include working for land reform, human rights, or addressing the economic disparities and poverty amongst the population.

ASPECTS OF A SUCCESSFUL COUNTERINSURGENCY

The Mexican government has adopted a counternarcotics approach to combat VDTOs. Its approach has been extremely military intensive. The Calderon administration deployed thousands of federal troops to battle VDTOs and specifically to target the groups' key leaders in a largely anti-crime, anti-drug strategy. It focused little on efforts identifying the societal conditions that allow these organizations to conduct operations and grow in strength everyday. Similarly, its heavy-handed approach has distanced many civilians, who not only have public grievances that are unheard by the government, but also are caught up in the violence and fear for their security. The authorities have tried to involve police forces in their work but its effectiveness is hampered by endemic police corruption. As a result, the military almost functions like a separate unit. It has been noted that, "the Mexican military has in recent decades been held largely separate from the rest of Mexican society. While this separation has...discouraged the military from taking over the state directly, this arms-length relationship does not in fact constitute civilian control of the military. In fact, the Mexican military almost completely controls what it considers to be its own internal affairs, with little civilian oversight."[20]

This relationship between the military and civilian branches of government is neither typical nor desirable in democratic countries like Mexico. Additionally this is not an optimal approach to combating VDTOs, who will require a combined military, police, and political force to be controlled. Therefore, a successful counterinsurgency approach has two important elements outlined below.

Provide security

According to the U.S. Army's counterinsurgency doctrine, the first pillar of COIN involves identifying the insurgents, establishing order and rule of law, protecting the population, and fighting the insurgents.[21] This requires the combined efforts of the military, police, and intelligence. This also involves shoring up borders so that the insurgents cannot receive sanctuary or outside support such as money and weapons. The government must prove it is capable of protecting the population from violence not only to ensure its own legitimacy in the eyes of the people, but also because security is a precondition for further political or economic action.

Provide civil and political action

The second pillar of COIN involves providing education, health care, governance, infrastructure, and opportunities for economic advancement. Public grievances must be addressed and public goods provided to the people for COIN to be successful. A framework should be put in place so that civilians feel that they have political voice, representation, and a role in the governing of their country or local municipality. The government must establish itself as a more legitimate force than the insurgency not only in its military capacity, but also in its ability to provide for its people.

WEAKNESSES OF CURRENT POLICIES IN MEXICO

Failure to identify the first phases of an insurgency

The 2011 RAND report states five worrisome conditions that exist in Mexico and could give rise to a proto-insurgency, if they have not already. These include: existing rebel, terrorist, and criminal groups, high unemployment and underemployment, significant unmet expectations regarding opportunities and sharp economic reversal, presence of a youth bulge, government corruption, and low rule of law. All of these factors point to the fact that Mexican border cities such as Ciudad Juarez, Tijuana, and Nuevo Laredo – which display all of the aforementioned conditions and are situated on key trafficking routes – are highly vulnerable to continued unrest. Furthermore, RAND's report used a counterinsurgency scorecard to compare Mexico to 30 historical cases of insurgencies. Mexico's score ranked in the middle, between those that have used COIN successfully and those that have not. This suggests that COIN strategies could have a near-equal chance of success or failure in Mexico. The difference may be in Mexico's application of the strategies and whether or not it can avoid pitfalls in the process that others have experienced, particularly the failure to acknowledge the existence of an insurgency until it is fairly robust.[22]

Widespread government corruption

The RAND report also applied a Defense Sector Assessment Rating Tool (DSART). The tool can be used to systematically assess the strengths and weaknesses of Mexico's defense sector. Based on DSART, it was found that Mexico's security infrastructure has limited capabilities to counter drug trafficking, terrorism and insurgency, and porous land and maritime borders. Mexico's weakest capabilities are also related to policing (e.g., the ability to police, prosecute, and incarcerate drug traffickers), the ability to maintain law and order, and the ability to integrate military and law enforcement operational support.[23] These security capabilities are all particularly poor because Mexico suffers from corruption within its police forces, which have been infiltrated by the VDTOs especially at the local and state levels. Low pay and a lack of incentives can make working for the VDTOs a more attractive offer. Now it appears corruption may be spreading into even higher ranks of the government. "In May 2012, the Mexican government detained three high-ranking Army generals, including a former second in command at the Defense Ministry, suggesting the depths to which drug cartels have gone in trying to infiltrate one of the primary forces Mr. Calderón has counted on to combat them. The three generals played a role in facilitating drug trafficking and the accusations against the third general include that he ignored a tip by American drug agents about an imminent airplane delivery of a drug cartel's cocaine in December 2007."[24]

Finally, the RAND report conducted a counterinsurgency scorecard for Mexico's current situation. Mexico scored low in the majority of the categories, as true COIN measures have not yet been deemed necessary. More interesting, however, are some of the factors on which a consensus could not be reached. They include: government leaders selected in a manner considered just and fair by majority of population in the area of conflict; majority of citizens view government as legitimate in the area of conflict; government a functional democracy; and government providing better governance than criminals in areas of conflict.[25] The lack of consensus on these issues points to the fact that corruption plays a role in undermining the government's capabilities and legitimacy.

Failure to tackle political, social, and economic roots of narco-trafficking

The decision to employ counternarcotics, counterterrorism, or counterinsurgency doctrine and strategies must all be based on the understanding that poor socioeconomic conditions, lack of civil rights, and poor rule of law give rise to a host of problems. Therefore any "counter" government policy should include a civilian pillar to address the underlying conditions. Current Mexican policies have been lacking in this area. President Calderon has opted for a heavy-handed military approach to fight VDTOs, but he has neglected equal investment in Mexican civil society. For example, an aggressive jobs program for the unemployed could provide better alternatives for people than jobs offered by the cartels. In addition, there have been reports that the Mexican military has in some cases used excessive force and committed human rights abuses. Historical cases of counterinsurgencies, such as Vietnam and Algeria, have proven that heavy military force does not always mean success.

Finally, the government has failed to protect a key aspect of democracy—freedom of speech and press. The VDTOs have targeted news and media organizations that publish information portraying them in a negative light. "Fearing for their lives and the safety of their families, journalists are adhering to a near-complete news blackout, under strict orders of drug smuggling organizations and their enforcers, who dictate—via daily telephone calls, e-mails and news releases—what can and cannot be printed or aired."[26] On numerous occasions news organizations have been attacked and journalists gunned down by the VDTOs. This has led to some organizations closing their doors permanently. Without the media, the public is uninformed about the true extent of the conflict. The government has failed to protect organizations that work to uphold a pillar of democracy and without them the VDTOs will continue to gain power. In fact, Mexico ranks 153 out of 179 countries in international freedom of press rankings.[27]

Given the weaknesses of current policies in Mexico, the application of COIN doctrine can provide several solutions to the problems facing the Mexican government. There are several strategies that the government could consider adopting that could specifically address the weaknesses outlined above and lead to a more effective campaign against the VDTOs.

SOLUTIONS AND THE APPLICATION OF COIN

Strengthen the police

Corruption amongst the Mexican police forces must end. In fall 2011, President Calderon stepped up calls for Mexico's Congress to approve stalled initiatives to remake state and local police forces, codify the military's role in fighting crime and broaden its powers, toughen the federal penal code and tighten laws to stop money laundering.[28] The key element of these reforms is the remaking of the police forces. The government must continue to "clean house" because corrupt police forces cannot exist in a successful COIN campaign. The provision of incentives and higher pay are the best options for keeping the police on the side of the government. The government may also want to consider temporarily removing police forces from areas of conflict, i.e. where the VDTOs are strong, teaching and training them in separate areas, and then returning them to combat the VDTOs in conjunction with the military.[29]

The importance of the local and state police cannot be understated. While the military's role is to establish order and security in conflict areas, the U.S. Army's Counterinsurgency Field Manual stressed that successful COIN campaigns hinge on the police that work with the population and eventually take over all key responsibilities.[30] Historical insurgencies from Malaya, Vietnam, and even Iraq have proven this point.

Offer amnesty

According to Professor Anthony James Joes in *Resisting Rebellion: The History and Politics of Counterinsurgency*, offering amnesty is an important element of COIN strategy. An amnesty program must be based on a realistic understanding of why people become guerillas. The would-be-amnesty-taker needs to know that he will have someplace to go, work to do, and protection from reprisals.[31] The VDTOs easily recruit from a population that is unemployed or underemployed, disenchanted with their government, and helpless to stand up against drug-traffickers that threaten their lives and the lives of their families. However, given safer, more stabile options these people may choose a less dangerous lifestyle and leave these organizations. The government could cripple the framework of these organizations if it could drain them of the people they desperately depend upon to operate.

Continued U.S. support

The U.S. strategy for Mexico should be to show support for the current campaign in an advisory role, particularly to Mexican police reform programs. The 2011 RAND report on the VDTOs showed that Mexican intelligence capabilities are extremely poor, and corruption hinders the actions that can be taken on the intelligence that is collected However, the United States has been much more successful with its intelligence collection. This has led to several arrests of key VDTO leaders and aid to the Mexican government. In fact, in February 2011, the Pentagon began flying high-altitude, unarmed drones over Mexican skies in hopes of collecting information to turn over to Mexican law enforcement agencies.[32]

In addition, the United States Marines have had a role in training Mexican military forces. Much of this work occurs on the Rio Grande border as the U.S. is trying to maintain an advisory role and does not overstep its geographic territory.

The Mexican government may want to evaluate this strategy because much can be gained, including expertise and military technology, by continued training with U.S. military and police forces. The government could also establish training programs modeled on the Civil Operations and Rural Development Support (CORDS) program in Vietnam and the Provincial Reconstruction Teams (PRTs) in Iraq and Afghanistan.[33, 34] These are advisory units that match up U.S. personnel with Mexican military and police forces, and could provide an opportunity for expert training in COIN and other strategies. This approach would require an increased U.S. role in Mexico, but given U.S. interest in its neighbor's future and domestic demand for the illicit drugs at the center of the situation, is worth considering. The United States also has a vital interest in ensuring that a full-blown insurgency does not break out along its border.

Focus on the civilian aspect of COIN

As stated earlier, the government should work to eliminate the underlying conditions that empower the VDTOs. Job creation for the poor and VDTO employees is important. In March 2010, aided by the United States, Mexico began to make headway in this area. The goal was to refocus their efforts on strengthening civilian law enforcement institutions and rebuilding communities crippled by poverty and crime. As one *New York TImes* article put it,

> The $331 million plan includes a revised strategy with elements meant to expand on and improve programs already under way as part of the so-called Mérida Initiative...including cooperation among American and Mexican intelligence agencies and American support for training Mexican police officers, judges, prosecutors and public defenders...American and Mexican agencies would work together to refocus border enforcement efforts away from building a better wall to creating systems that would allow goods and people to be screened before they reached the crossing points. The plan would also provide support for Mexican programs intended to strengthen communities where socioeconomic hardships force many young people into crime.[35]

THE FUTURE OF MEXICO

Counterinsurgency is a holistic approach that can address issues present in Mexico beyond narcotics and crime. Counterdrug efforts have so far proven to not only be ineffective, but may also have played a role in increasing the violence. Newly elected President Enrique Peña Nieto should consider COIN strategies in his government approach to combating the VDTOs. The decision is a delicate one, as Peña Neito's choice could drive the situation from a proto-insurgency to an actual insurgency. Nieto has already stated that while Mexico should continue to work with the United States government against organized crime, it should not "subordinate to the strategies of other countries."[36] He has promised to move law enforcement away from showy drug busts and focus on protecting ordinary citizens from gangs.[37]

Peña Neito's administration has said it will focus more on reducing crimes against ordinary citizens, such as murder, kidnapping, and extortion, than on pursuing the leaders of the VDTOs. The first step in this is the "creation of a 10,000-person national gendarmerie—or paramilitary police force—designed to patrol far-flung areas where local law enforcement and military forces have failed to eradicate widespread crime."[38] In addition, the government will spend $9.2 billion this year on social programs to keep young people from joining criminal organizations in the 251 most violent towns and neighborhoods across the country.[39]

These policies align themselves well with COIN doctrine and could have a significant impact on the VDTOs. Peña Nieto has not provided a specific timeline and critics view this strategic shift in policy as a disguised attempt to ease back the pressure on drug cartels in hopes of returning Mexico to the days of lower violence and a more laissez-faire attitude toward drugs.[40] Nieto should consider continuing to take advantage of American assistance and implementing counterinsurgency strategies and tactics that are well aligned with VDTOs methods, in order to prevent the current drug violence from possibly morphing into a full-blown insurgency. At the very least, the Mexican government should experiment with the adoption of COIN policies in order to stem the country's growing violence.

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Second Generation DDR:
New Approaches to Traditional Disarmament, Demobilization, and Reintegration of Ex-Combatants

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In the post-Cold War world, post-conflict environments are characterized by states in which governments are unable to contain armed non-state actors like insurgents, organized crime, and militias that challenge the state's legitimacy and threaten civilians. The first step in reestablishing this control the process of disarmament, demobilization and reintegration (DDR), which is intended to engender security and stability after conflict by disarming fighters, extracting them from military structures, and assimilating them into society. As such, DDR's integral role in transitions from war to peace has become a widely accepted concept, exhibited through its presence in the mandates of nearly all peacekeeping operations in the last two decades. This article seeks to provide an explanation of the traditional methods of DDR, examine emerging trends in this area known as "Second Generation DDR," and explore how its current application has been shaped by an evolution in both theory and practice.

In the post-Cold War world, post-conflict environments are characterized by states in which governments are unable to contain armed non-state actors. Insurgents, organized crime networks, and militias challenge the state's legitimacy and threaten civilians. The establishment of the rule of law, therefore, is a primary objective in any post-conflict stabilization operation or nation-building effort. In order to uphold the rule of law and protect its citizens, a state must have a monopoly of force.[1] Regulating violent non-state actors is a prerequisite to ensuring state legitimacy, public order, and the necessary security to foster long-term social, political, and economic development.

The first step in establishing a state's monopoly of force is disarmament, demobilization, and reintegration (DDR), a process that engenders security and stability after conflict by disarming fighters, extracting them from military structures, and assimilating them into society. DDR's integral role in transitions from war to peace has become a widely accepted concept, as evidenced by its presence in the mandates of nearly all peacekeeping operations over the last two decades. Since it debuted as an instrument of United Nations (UN) peacekeeping interventions in the 1980s, the concept and practice of DDR has changed considerably. Given the increasing deployment of UN operations in complex, intrastate conflicts in the post-Cold War era, the need to complement traditional DDR with practical measures to address these new contexts has become clear. Present-day peacekeepers require more sophisticated techniques to navigate the local dynamics on the ground, which may not be susceptible to traditional models of peacekeeping initiatives that have typically targeted warring parties in a top- down approach. Consequently, a new set of policy options, collectively known as "Second Generation DDR", has emerged, reflecting the broader change in UN peacekeeping. While not a formal strategy, Second Generation DDR is an approach increasingly adopted by peacekeepers in certain regions.

The goal of this paper is to offer an overall picture of current trends in DDR programs and explore how these practices differ from "traditional" DDR processes. This paper will provide a brief discussion of the history of DDR, before exploring how its current application has been shaped by an evolution in both theory and practice.

DEFINITIONS

The objective of DDR is to contribute to security and stability in post-conflict settings, in order to allow the necessary space for recovery and development to take place. The DDR of former combatants is a complex process, with political, military, security, humanitarian, and socio-economic implications. The process is intended to manage the security dilemma that ensues when ex-combatants are left without livelihoods or support networks during the critical period of transition from war to peace and development.[2] The following are definitions accepted by the United Nations Department of Peacekeeping Operations (DPKO)[3]:

- **Disarmament** is the collection, documentation, control and disposal of small arms, ammunition, explosives and light and heavy weapons from combatants and often from the civilian population.

- **Demobilization** is the formal and controlled discharge of active combatants from armed forces or other armed groups. The first stage of demobilization may extend from the processing of individual combatants in temporary centers to the massing of troops in camps designated for this purpose… The second stage of demobilization encompasses the support package provided to the demobilized, which is called reinsertion.

- **Reintegration** is the process by which ex-combatants acquire civilian status and gain sustainable employment and income. Reintegration is essentially a social and economic process with an open timeframe, primarily taking place in communities at the local level.

Despite the differences, as outlined in a 2005 working paper for the Geneva Centre for the Democratic Control of Armed Forces (DCAF), "Both 'DD' and 'R' strongly depend upon each other: successful reintegration measures are just as important for a sustainable success of demobilization and disarmament as successful disarmament is the precondition for the beginning of a reintegration programme."[4] However, relations between the three steps are often fraught with tension. With a primary focus on the consolidation of security on the ground, disarmament and demobilization fall under the auspices of the military. Reintegration, on the other hand, is a component of wider, long-term development goals and thus lies within the responsibility of civilian actors.[5] Of the three components, reintegration poses the greatest challenge: it is certainly the most expensive and labor-intensive, requires a longer-term commitment, and cannot be fully evaluated based on numeric outputs. Nevertheless, successful reintegration is considered critical to any sustainable outcome as it contributes to the revival of social capital (the collective economic and social benefits derived from cooperation between members of a society). Conversely, inadequate reintegration can lead to widespread societal insecurity.[6] Given its far-reaching implications, the concept and practice of the reintegration phase has been the subject of the majority of DDR policy innovations.

TRADITIONAL APPROACHES TO DDR

Historically, DDR was perceived as a military operation intent on the integration of former soldiers into existing social structures, with a restricted set of objectives linked to the establishment of security. The programs that emerged in the late 1980s and throughout the 1990s focused on preventing the obstruction of the peace process by armed groups.[7] The first United Nations peacekeeping operation to undertake disarmament and demobilization was the United Nations Observer Group in Central America (ONUCA), which from 1989 to 1992 carried out the voluntary demobilization of anti-government factions in Nicaragua. In the decade following ONUCA, DDR activities were included in most UN peacekeeping operations, including missions to Liberia, Sierra Leone, Angola, Mozambique, Haiti, Somalia, and the Central African Republic. The programs in these missions, though country-specific, tended to follow certain patterns associated with traditional DDR—namely, a preoccupation with top-down, short-term logistical operations aimed at the removal of weapons and expeditious processing of former combatants.[8] Success was narrowly expressed in terms of the number of reintegrated ex-combatants and the absence of a reversion to war. The programs embraced a "guns, camps, and cash" approach, characterized by counting armaments, setting up cantonment camps, and doling out reinsertion and reintegration packages.[9] Until the mid-2000s, DDR was understood as a limited activity, socially and territorially isolated from other processes.[10] Generally conceived as a linear procedure aimed at the total elimination of the military capacity of hostile forces, traditional DDR begins with disarmament, followed by demobilization, and ending with reintegration.

During the disarmament phase, combatants were screened to determine whether they qualified for DDR program services. While eligibility criteria can be found in most peace agreements or national legislation, traditional DDR programs face certain predicaments when determining who exactly is a genuine combatant, particularly in the context of intra-state conflicts, where many belligerents are coerced or part-time.[11] Because the intention of 1990s-era DDR was to counteract potential spoilers of peace accords, those targeted to receive program services were individuals deemed most dangerous to reconciliation. This assumption ensured that those labeled eligible for reintegration packages in early DDR programs were almost exclusively men.[12] In most cases, early programs limited participation to individuals in possession of weapons, effectively excluding other groups that held vital support roles for armed fighters.[13] Because they did not qualify for assistance benefits targeted toward male combatants, many women and children were unable to cope with the transition to civilian life.[14] Furthermore, singling out one group for benefits has shown to foster contention among communities by creating a perception of unequal opportunities, making true reintegration even more challenging.[15]

In order to attract ex-combatants, and to lessen the costs of reintegration into civilian life, early DDR programs provided cash incentives for those who handed over weapons. Until recently, the UN relied predominantly on weapons-for-cash programs, which were considered the best way to induce compliance with the process and accelerate disarmament.[16] With experience, however, it became evident that weapons-for-cash programs tended to attract old and unusable weapons, and unintentionally stimulated the growth of illegal arms markets, leading to an inpouring of weapons into the country.[17] Setbacks in demobilization efforts can also be blamed on a failure to account for the motivations influencing mobilization. Financial gain is only one of many reasons people take up arms. Yet conventional DDR programs ignored possible motivations like family and village protection or forced mobilization, exclusively addressing the presumed economic incentives of combatants.[18]

Conventional reintegration procedures focused wholly on assisting individual ex-combatants. This type of programming is based on the assumption that by instilling former fighters with skills and resources, they would reintegrate into civilian life naturally.[19] With all energy exerted on ex-combatants, traditional DDR programs regularly neglected the communities into which the individuals were to be reintegrated, and were carried out without local buy-in.[20]

A CHANGING ATTITUDE

As the previous section sought to demonstrate, DDR has long been deemed necessary for the long-term peacebuilding process, and has thus become an integral part of post-conflict reconstruction efforts. The wider social implications that influence conditions for security sector reform (SSR) have frequently been overlooked, though a number of experts have begun to recognize their importance.[21] Discourse on both theory and practice tends to treat DDR and SSR as separate and independent programs, as they involve different actors, priorities, timelines, and functions.[22] This perception is incorrect, according to Sean McFate of the United States Institute of Peace (USIP). McFate posits that DDR and SSR, as the two fundamental tools for monopolizing the use of force, succeed or fail together and therefore should be jointly planned, funded, executed, and assessed.[23] Michael Brzoska agrees with this notion, writing that "DDR influences the conditions for SSR both on the supply side—by setting initial force sizes and selection between who is to be demobilized and who not—and on the demand side—by affecting the security situation, particularly with respect to crime and the likelihood of resurgence of armed conflict."[24]

The idea that the processes of DDR and SSR each contribute to the enabling conditions of the other's success could be seen clearly in the example of post-9/11 Afghanistan. The messy war and reconstruction effort in the country brought to light the deleterious effects of treating these related processes as separate functions. The December 2002 conference of foreign ministers in Germany was the first attempt to link the DDR process with security sector reform in Afghanistan.[25] Those favoring increased integration of DDR and SSR recognized that the country's armed groups had to be disarmed and demobilized if a national army was to be built, and that the new army had to be formed at the same time as disarmament to respond to the potential security vacuum generated by the DDR process.[26] It was believed that a successful DDR program could contribute to the Afghan government's monopoly of force by providing ex-combatants with incentives to enter civilian life, thereby limiting armed challenges to the state. Furthermore, once vetted, trained ex-combatants could be reconstituted as members of the new national army or police force, contributing to the revival of the new security sector.

In acknowledgment of the inherently complex relationship between the political, security, and socio-economic dimensions of DDR, in 2006 a UN interagency working group published the Integrated DDR Standards (IDDRS).[28] The IDDRS was drafted to offer guidance to those involved in the implementation of DDR programs through a comprehensive collection of established practices and lessons learned. Central to IDDRS are the ideas that DDR programs should be tied to other peacebuilding initiatives like SSR, and that they should be devised in a participatory manner, in consideration not only of ex-combatants but also of entire communities.[29] The publication took meaningful steps to address the needs of vulnerable individuals and target groups outside the traditional adult male combatants. In addition, the report includes a set of preconditions that should be in place before a DDR program can begin. These are "the signing of a negotiated peace agreement that provides a legal framework for DDR; trust in the peace process; willingness of the parties to the conflict to engage in DDR; and a minimum guarantee of security."[30] Increasingly, however, UN peacekeepers are being deployed in situations where these prerequisites are not met, and where international interveners encounter insecure environments and active uncontrolled armed groups, such as militias and gangs.

Therefore, despite its progressive stance regarding community involvement and inclusion of vulnerable groups as beneficiaries of DDR assistance, the IDDRS fails to take into account the changed nature of present-day conflicts. To bridge this gap, the guidance provided in the IDDRS must be complemented with practical measures that address these new contexts. This is where "Second Generation" measures come in, because they offer policymakers and practitioners alternative provisions for the administration of DDR in situations where the stated preconditions do not exist.

SECOND GENERATION DDR

Second Generation measures are not necessarily intended to replace traditional DDR processes, but rather to work alongside them in a complementary manner. Support of the peace process, the creation of political space, and the contribution to a secure environment are the strategic objectives of both Second Generation DDR and its traditional counterpart.[31] Nevertheless, the two differ when it comes to the question of how best to reach these shared goals. Unlike traditional DDR initiatives, which focused on the soldiers who comprise military structures, Second Generation programs turn the attention on the communities affected by conflict. Rather than addressing technical elements of a peace agreement, Second Generation activities are locally administered and rely on evidence-based approaches in order to remain flexible in the face of new developments.[32] Whereas traditional DDR follows a linear process of sequential steps from disarmament, to demobilization, to reintegration, the new approach undertakes the three concurrently.[33] Second Generation measures can be subdivided into three broad categories: post-conflict stabilization measures, specific group targeting, and alternative approaches to addressing disarmament and unregulated weapons.[34]

Post-conflict stabilization measures

This category includes emergency employment programs and sub-national/community approaches to security and violence reduction. These policy options respond to situations in which communities are plagued by diffused violence generated by non-state actors, and where national security institutions are unable to quell such threats due to limited state presence.[35] Traditional DDR is aimed at upholding national security, rather than human or community security; and therein lies its main weakness. If security at the community level is not enhanced, people will be unprepared to relinquish armed violence as a means of protection and economic survival.[36] Therefore, it is imperative for DDR activities to promote community security in a manner that will increase the ability of individuals to protect themselves and earn a living without the use of violence. Sub-national and community approaches carried out in the name of Second Generation DDR do just that. These techniques recognize that national security is inseparable from community security, and from human security at the individual level.[37] Intended to tailor interventions to mitigate risks and suit the needs of specific communities, Second Generation initiatives are influenced by local cultural norms rather than stringent externally assigned incentives, and community-based leaders and groups rather than national institutions.[38] Community-specific dynamics inform a strategy that blends an assortment of activities. These activities include, but are not limited to: weapons collections, youth outreach programs, vocational training, medical assistance, and legal council. For example, in Liberia, the UN used information gathered through community "hot-spot" assessments for the design of targeted reintegration programs and as a way to monitor emerging security threats.[39] Hot-spot assessments ensure that stabilization strategies respond to local circumstances while enabling proactive, rather than reactive, responses.[40]

Former combatants often return to utterly strenuous environments, in which they are unlikely to be seen as assets to the community—but rather as killers, criminals, or burdens on the community. Because the success of reintegration is contingent upon the support that ex-combatants receive from their families and communities, Second Generation measures work not only toward the absence of bloodshed, but for the acceptance of former combatants into communities, and their participation in those communities.[41] Projects that explicitly benefit ex-combatants, without providing clear advantages to the rest of the community, may jeopardize the stability of local environments. This was evident in Sierra Leone, where the UN had to admit in 2003 that "the targeted reinsertion benefits were sometimes perceived as rewarding perpetrators of violence and atrocities and often led to increased tensions between host communities and ex-combatants rather than an investment in peace and reconciliation."[42] For this reason, community-based emergency employment programs should be designed and implemented in consideration of the project's potential contribution to long-term job creation, labor market demands, and development goals.[43]

Emergency employment programs are embraced as a way to provide monetary incentives as an alternative to violence. They typically entail labor-intensive projects related to the reconstruction of infrastructure, along with agriculture and manufacturing ventures.[44] In Liberia, for example, the UN and the World Bank joined forces in 2006 to address employment for community members and conflict-affected populations through the repair of vital road networks. One project, the rehabilitation of the Gbaranga-Zorzor and Zwedru-Tappita highways, created more than 8,000 jobs and stimulated the economy by opening up avenues to new markets.[45] A post-project evaluation indicated a reduction in petty crime and domestic violence, and suggested a link to longer-term employment, as a number of beneficiaries actually invested a portion of their earnings into additional income-generation endeavors.[46] These types of projects, which require large investments, are essential where national governments lack the resources and capacity to implement them on their own. Moreover, involving governments in projects that produce tangible outcomes can build confidence in the peace process and promote state legitimacy.

Targeting specific groups

A number of these policy preferences are directed at undisciplined armed groups, and introduce techniques for identifying group-specific needs, interests, and capabilities. DDR initiatives aimed at militias or unorganized armed factions offset the shortcomings of conventional DDR approaches by addressing violent groups that may not be represented in a formal peace process. Because effective DDR targeted to lesser-known factions depends on in-depth analysis, hot-spot assessments are valuable tools that may be used to identify the agendas, motives, strategies, and influence of irregular armed groups.[47]

While traditional DDR programs tend to treat ex-combatants as a homogeneous group, new approaches seek to differentiate between ranks.[48] A major obstacle in most post-conflict contexts is that middle- and high-ranking officers are often in a position to partake in illegal activities, particularly the trade in drugs and arms, and may remobilize into organized crime networks.[49] As a means to combat this scenario, Second Generation DDR makes use of commander incentive programs (CIPs) that support the dismantling of command structures by providing tangible incentives for peace and mitigating potential spoilers.[50]

In recognition of the links between youth surges and violence in post-conflict settings, especially in environments with minimal employment opportunities, Second Generation approaches attach great importance to targeting at-risk youth. The National Youth Employment Program (YEP) was initiated in Sierra Leone in 2005 to prevent further marginalization of the nation's youth, and enhance their qualifications to participate in decision-making processes so as to minimize incentives for joining armed groups.[51]

Alternative approaches to addressing disarmament and unregulated weapons

Sequencing flexibility, weapons management, and weapons-for-development initiatives are policy options intended to operate in situations where traditional DDR is ineffective and when disarmament is not a realistic goal at the outset of a mission.[52] Implementing reintegration programs first can serve as an incentive for genuine and sustainable disarmament and demobilization by demonstrating to combatants how they can earn a living without their weapons. The assumption that successful reintegration will pave the way for future disarmament is exemplified in the concept of "disarmament by default," which refashions traditional linear DDR sequencing. One example of this is the 1,000 Micro-Projects Programme, carried out in 2008 in Cote d'Ivoire. The program provided educational, psychosocial, and employment assistance to at-risk youth, militias, and combatants who had not yet been formally disarmed.[53] Although the official political process called for disarmament to occur early on, "disarmament by default" allowed the political process to move forward without formal disarmament.

While traditional DDR programs relied heavily on weapons-for-cash programs, more sustainable disarmament may be realized through weapons-for-development programs, in consideration of the overall goal of development. Through a reward system, such policies place the reins of the disarmament process in the hands of the community as a whole, rather than those of the individual.[54] In place of cash rewards, communities profit from development projects constructed to account for local deficiencies such as schools, wells, and agricultural assistance. In 2002, an Arms for Development pilot project was launched in Sierra Leone that prompted four chiefdoms to surrender their weapons before being searched by the national police. Communities tagged as "weapons-free" would be awarded a certificate and a grant of 40 million Leones (about US $15,000) for the implementation of a community development project.[55] The project was so successful it was later extended to the rest of the country.

Additionally, new approaches to weapons management are being introduced in many post-conflict environments. By concentrating on a single state, previous DDR programs failed to account for the regional dimensions of conflict. Earlier country-level initiatives in Liberia have had disastrous consequences for the rest of West Africa as incomplete disarmament stimulated weapons markets in neighboring countries.[56] Second Generation DDR programs are increasingly designed in view of regional war economies, transnational networks, and uncontrolled border areas.[57]

To tackle the massive small arms and light weapons (SALW) problem in West Africa, the Economic Community of West African States (ECOWAS) has adopted a regional approach.[58] Under this plan, National Commissions of member states oversee the formation of a Regional Arms Register and Database, train security personnel to monitor and document the illicit flow of arms in the border zones, and harmonize relevant laws in the sub-region.[59] The ECOWAS initiative is in step with recent shifts in DDR trends towards multi-country coordinated approaches.

CONCLUSION

The nature of conflict has changed dramatically since the end of the Cold War; the traditional security distinctions between civilians and combatants, and victims and perpetrators, are much less discernable. This paper has attempted to illustrate that the complex environments in which international interveners operate can be better managed through a new set of policy options that fall under the umbrella of "Second Generation" DDR. The evolution of DDR doctrine mirrors the wider shift in peacekeeping discourse founded on the recognized links between security and development. Without long-term development efforts, short-term security endeavors cannot beget sustainable benefits because they treat the symptoms, rather than the causes, of violent conflict. With this in mind, peacekeeping missions have moved away from a limited conception of post-conflict stabilization efforts, and toward a more multidimensional and inclusive approach focused on social welfare objectives as well as security.[60] Interventions have expanded from a narrow preoccupation with ex-combatants and weapons, to an emphasis on reconstruction and development.

Key trends in DDR evolution include: the expansion of targeted groups to include vulnerable populations along with former combatants; attention to regional dimensions of conflict; and a move away from technical programs and toward nation-building processes in the context of broader political and economic determinants. In short, Second Generation DDR activities refocus the emphasis from top-down interventions devised by outsiders to more locally designed and operated strategies. Second Generation DDR policy options provide peacekeepers with a more sophisticated toolkit to navigate local dynamics, which most likely do not reflect the arrangements made by international actors. Perhaps most importantly, policymakers and practitioners are beginning to see that DDR is undeniably linked to security sector reform. This noteworthy recognition should not be taken lightly, as establishing public trust in state security institutions is a necessary condition for ex-combatants to willingly hand over their weapons.

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ENDNOTES

[1] The concept of "monopoly of force," is borrowed from Max Weber's classic interpretation of the state as "a human community that claims the monopoly of the legitimate use of physical force within a given territory." Sean McFate, "There's a New Sheriff in Town: DDR-SSR and the Monopoly of Force," In Monopoly of Force: The Nexus of DDR and SSR, ed. Melanne A. Civic and Michael Miklaucic (Washington, DC: National Defense University Press, 2011), 213.

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[4] Reto Rufer, "Disarmament, Demobilisation and Reintegration (DDR): Conceptual Approaches, Specific Settings, Practical Experiences" Geneva Centre for the Democratic Control of Armed Forces working paper, 2005, 12.

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[10] Robert Muggah, Innovations in Disarmament, Demobilization and Reintegration Policy and Research: Reflections on the Last Decade (Oslo: Norwegian Institute of International Affairs, 2010), 11, http://english.nupi.no/content/download/13642/128894/version/6/file/WP-774-Muggah.pdf

[11] Waldorf, "Linking DDR and Transitional Justice," 19.

[12] Reintegration packages typically include monetary stipends, social services, and education and training for civilian life.

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[14] The Center for Stabilization and Reconstruction Efforts (CSRE), "An Expansive Approach to Disarmament, Demobilization, and Reintegration," (Monterey: Naval Postgraduate School, 2010), 3, http://www.csrs-nps.org/logistica/public/docs/expansive_ddr_feb2010_FINAL.pdf (accessed April 19, 2012).

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[21] The objective of SSR is the consolidation of the state's monopoly of force in order to bring security to the people. The process involves the transformation of unstable components of the security sector—institutions like the military or national police force—into professional, effective, legitimate, and accountable security bodies (McFate 2010, 4).

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[36] Frerks, "Community-Based Security Provision," 8.

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[44] *Ibid.*

[45] *Ibid.*, 24.

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[47] *Ibid.*, 24.

[48] Stankovic and Torjesen, "Fresh Insights on Disarmament," 9.

[49] UNDPKO, "Second Generation DDR," 25.

[50] *Ibid.*

[51] *Ibid.*, 49.

[52] *Ibid.*, 28.

[53] *Ibid.*, 54.

[54] *Ibid.*, 29.

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[56] Rufer, "DDR: Conceptual Approaches," 44.

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Dairy Biogas in California:
Cost-Effective Development

DANIEL L. SANCHEZ
EDITED BY KATE DANIEL AND ANNA SCODEL

Biogas is a renewable fuel with several co-benefits, yet it has seen relatively little development in the state of California. This is due to both the costs of biogas technology and barriers to widespread deployment. This paper examines the potential, barriers to and financial drivers of biogas and offers some solutions for promoting the development of the industry in California. Financial and policy barriers to development include low natural gas prices, high capital costs, scale issues, and environmental permits. The paper finds that project revenues are more sensitive to carbon offset prices than electricity prices, under feasible price ranges. Offset prices that provide adequate return on investment (ROI) for project developers are between $12 and $24 per metric ton of carbon dioxide equivalent (MT CO_2e).

The paper makes several recommendations to promote in-state, cost-effective biogas development. Namely, policymakers and project developers should promote a robust carbon offset market, develop co-digestion where feasible, consider carbon offset revenues in setting electricity prices for Renewables Portfolio Standard (RPS) procurement, and continue and expand information exchange. These actions will allow biogas to be developed cost-effectively while protecting ratepayers.

OVERVIEW: BIOGAS POTENTIAL AND CURRENT CAPACITY

Biogas is a form of renewable energy with many attractive attributes: it provides flexible, dispatchable electricity generation, prevents methane release into the atmosphere, and can be used as a fuel in many parts of the existing energy infrastructure. Despite its robust potential in California, biogas has not grown at the same rate as other renewable energy technologies like wind and solar. This is due to both the costs of biogas technology and barriers to widespread deployment.

What Is Biogas?

Biogas is produced by the anaerobic digestion or fermentation of biodegradable materials such as biomass, manure, sewage, municipal waste, green waste, plant material, and crops. Biogas is primarily methane (CH_4) and carbon dioxide (CO_2), and may also contain small amounts of carbon monoxide (CO), hydrogen sulfide (H_2S) and moisture (H_2O). As a flexible renewable fuel, biogas can be used for any application in which natural gas is used: biogas can generate electricity, be compressed and used as motor vehicle fuel, or upgraded to a pipeline quality biomethane, a natural gas substitute.

This article discusses biogas derived from the anaerobic digestion of dairy manure and the use of that biogas as biomethane or to produce electricity in California. It does not discuss captured gas from landfills, also known as landfill gas (LFG), or biogas from wastewater treatment plants (WWTPs).

History of Biogas in California[1]

Due to the large number of dairy farms in California, there is great potential for biogas development. According to the EPA's AgSTAR program, California has the potential to produce up to 2,375,000 megawatt-hours (MWh) per year from biogas from 889 candidate dairy farms located throughout the state.[2,3] This is roughly 1 percent of total state electricity demand.

The rate of biogas development in California has varied widely over the past ten years, driven primarily by government support for technology development, the availability of subsidies, and state regulations. Prior to 2002, fewer than five dairies in California operated anaerobic digesters. Each of these dairies used the biogas produced by the digester to fuel a generator for onsite electricity use. The California Energy Commission (CEC) has provided grant funding of up to 50 percent of capital costs to support the construction of additional digesters at dairies. However, proponents of dairy digesters have found new air and water quality regulations difficult to understand and comply with, and several CEC-funded digesters ceased operation as a result of regulatory and financial problems.[4] As of May 2011, there were fifteen operational digesters in CA, and none currently under construction (for a map of some of these locations, see Figure 1).[5]

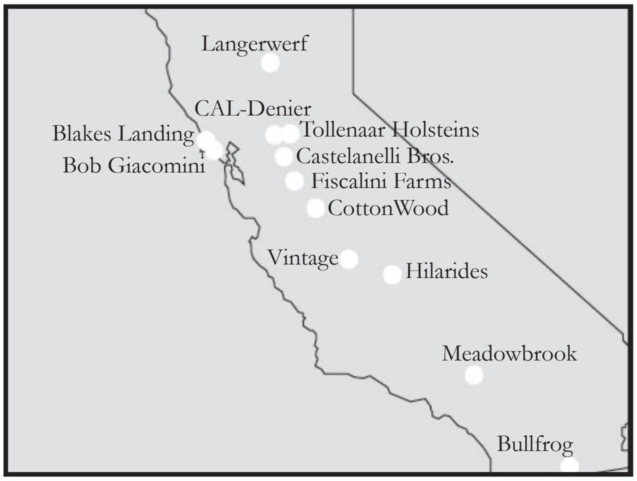


Figure 1: Locations of Dairy Biogas Digesters in California (Source: California Biomass Collaborative[6])

BIOGAS POLICY IN CALIFORNIA

Biogas and biomethane production impacts air quality, water quality, greenhouse gas (GHG) emissions, electricity procurement, renewable energy production, and natural gas distribution. While biogas can have positive effects on many of these issues, fragmented permitting and regulatory processes can prevent or delay project development.

CEC Suspension

On March 28, 2012, the CEC voted to suspend certification of pipeline biomethane projects as an eligible renewable technology under California's RPS due to concerns over possible double counting of the renewable energy attributes of biogas.[7] Recent legislation has clarified the RPS-eligibility of biomethane fueled facilities, and a March 2013 CEC draft guidance re-instated biomethane as an eligible renewable technology.[8,9] Nonetheless, the suspension created a considerable amount of regulatory uncertainty for biogas developers.[10]

RPS Procurement Programs

Biogas is also eligible for California's Feed-in Tariff (FiT), which was developed to offer standard contracts to small renewable projects.[11] The Commission has established two utility-scale distributed generation programs through which biogas projects can sell their electricity to the State's investor-owned utilities (IOUs): the Renewable Auction Mechanism (RAM) and the Renewable Market Adjustment Tariff (Re-MAT). Both of these programs are designed to procure energy at least cost, but account for the availability of different renewables (such as peaking as available, non-peaking as available, and baseload).[12] As prices are influenced by submitted project bids, the contract price that baseload generation (including biogas) will obtain is unclear.

On September 27, 2012, Governor Brown signed into law Senate Bill (SB) 1122, which created an additional 250 MW goal for small bioenergy projects under California's RPS. SB 1222 directs the Commission to develop separate standardized contracts for these bioenergy facilities, including 90 MW of dairy bioenergy capacity.[13]

Net Metering & Net Surplus Compensation

Several biogas sites in California with on-site electricity generation produce electricity through the Net Energy Metering (NEM) program. The NEM program was originally developed for owners of residential solar photovoltaic systems and did not compensate participants for any excess electricity generated. As on-site dairy digesters typically produce electricity in excess of on-site consumption, this led to significant loss in revenues and prompted facility owners to flare excess biogas supply. Since 2010, AB 920 has required California utilities to compensate biogas generators for excess generation through a Net Surplus Compensation (NSC) rate structure. While the prices paid under NSC are generally lower than prices paid under NEM, NSC has aided economic feasibility and minimized unnecessary flaring.[14]

AB32: California Global Warming Solutions Act

In November 2012, California conducted its first auction for its cap-and-trade program, implemented in response to AB 32, the California Global Warming Solutions Act.[15] The law creates incentives to reduce greenhouse gas emissions through a declining allocation of allowances. Current prices for allowances are approximately \$14/MT CO_2e.[16] At present, California plans to join the Canadian province of Quebec for a multi-region cap-and-trade program as part of the Western Climate Initiative (WCI).

Currently, livestock projects (including methane capture and destruction from manure management systems) are one of four compliance offset protocols adopted by the California Air Resources Board (CARB).[17] In March 2013, CARB listed twenty-five carbon offset projects from other project registries, including thirteen projects that destroy agricultural methane, that could produce compliance-grade offsets should they be verified by an accredited third-party verifier. Voluntary credits are currently valued at around \$8, but will likely rise to \$10 should they be converted to compliance grade.[18]

We discuss several other aspects of California's cap-and-trade program in our recommendations.

BARRIERS: PROJECT COSTS AND FINANCING FOR BIOGAS

California's biogas industry faces several barriers to growth. These include high costs, regulatory issues, and financing hurdles. Understanding each of these barriers is essential to unlocking cost-effective biogas development. The information presented below has been compiled from several reports and conversations with several biogas developers.

Existing Facility Costs

Biogas continues to be one of the more expensive renewable technologies in California. As Table 1 shows, the CEC's analysis of existing dairy digester projects found that the nominal levelized cost of energy (LCOE) for a biogas facility without subsidies ranged from $0.1016/kilowatt-hour (kWh) to $0.3716/kWh.[19,20] While the low end of that range is competitive with existing prices for other renewable technologies in California, it reflects a digester made from refurbished parts purchased at a significant discount, and is not indicative of LCOE for new digesters. These prices do not include environmental quality enhancements, including improved liners for lagoon storage systems. Given CARB and California Regional Water Quality Control Board, Central Valley Region (CRWQCB-CVR) regulations, we would expect these systems to have somewhat higher costs if they were built today, all else being equal.

Similarly, an analysis by ESA Associates, sponsored by the CRWQCB-CVR, found that none of their hypothetical digester systems had annual revenues high enough to ensure sufficient profitability. To ensure profitability, ESA's report notes that a revenue increase of 32 percent to 53 percent is required, corresponding to a productivity increase of between 128 percent and 392 percent.[22] We will be drawing upon ESA's report assumptions for the economic analysis presented later in this paper.

Major Cost Contributors

Biogas development faces many barriers in California that have hindered the widespread deployment of the technology. Of these, cost is the most direct factor affecting feasibility. Simply put, high technology costs, spurred by scale limitations, environmental regulations, and the nature of biogas production, limit biogas's economic feasibility.[23]

Low Natural Gas Prices

Biogas (including biomethane) and natural gas are nearly homogeneous commodities. However, price disparities between the two are one of the highest barriers for biogas development. Current prices for natural gas are below $4 per million British Thermal Units (MMBTU).[24] For pipeline-quality gas, the LCOE for biogas ranges from $12 to $48 per MMBTU.[25] This price disparity is due to recent shale gas discoveries in the United States as well as the continuing

Table 1: Digester Costs from Dairy Power Producer Program (DPPP) Participants
Nominal LCOE ranges from $0.10 to $0.37 /kWh (2007 dollars)[21]

Dairy Digester Type / Special notes	Capital Cost ($/kW)	Year 1 Wholesale ($/kWh)	Nominal LCOE (2007$) ($/kWh
Hilarides: Covered lagoon	2,643; 2005 $	0.0991; 2006 $	0.1016
Eden-Vale: Plug-flow	4,766; 2005 $	0.1720; 2006 $	0.1763
Koetsier: Plug-flow	5,611; 2005 $	0.1990; 2006 $	0.2040
Castelanelli: Covered lagoon	6,070; 2004 $	0.2160; 2005 $	0.2269
Van Ommering: Plug-flow	7,109; 2005 $	0.2550; 2006 $	0.2614
Meadowbrook: Plug-flow	6,466; 2004 $	0.2630; 2005 $	0.2763
IEUA: Modified mix plug-flow	14,547; 2005 $	0.3350; 2006 $	0.3434
Cottonwood: Covered lagoon	8,180; 2004 $	0.3375; 2005 $	0.3546
Blakes Landing: Covered lagoon	4,801; 2004 $	0.3540; 2005 $	0.3719

economic weakness. While natural gas prices are expected to rise in the medium-term, biogas faces daunting cost reduction needs without support from subsidies.

Interconnection

Although local electric utilities are potential customers for excess electricity production from on-site generation systems, connecting to the grid represents a cost barrier for some biogas projects. Due to large fixed costs, interconnection exhibits economies of scale. As the size of a dairy digester project increases, it is able to spread the costs of interconnection over more energy generation, leading to per-unit cost savings. Yet, because the output of biogas on dairy farms is dependent upon the number of cows, small dairies are unable to take advantage of these economies of scale. Streamlined interconnection procedures could improve the cost-effectiveness of these projects.

Upgrading to Pipeline-Quality Standards

The digester project may inject biogas directly into existing natural gas distribution systems, but first it must upgrade the biogas to achieve pipeline-quality standards.[26] This process also faces significant economies of scale, and while centralized upgrading facilities can mitigate this barrier, transport costs represent a significant diseconomy of scale. System design and location considerations are important to cost-effective upgrading. The proximity of a biogas location to both feedstocks and energy infrastructure has a large influence on overall system cost.

Digester Costs

While digester costs are a large part of the overall system costs, there is little opportunity for cost reduction from this "relatively simple and mature technology."[27] Technological improvements and resulting cost reductions are incremental, and there are more significant cost reductions possible for on-site electricity generation and biomethane upgrading technology. These include low emission internal combustion engines, microturbines, and fuel cells.

Environmental Impact Mitigation

State and local environmental and quality regulations affect biogas in several ways. Biogas developers undergo scrutiny from several different local and statewide agencies, each with different decision-making timelines.

Air-quality regulations, in particular, are a high hurdle to biogas development. In the Central Valley and South Coast, which are classified as extreme nonattainment areas for ozone, regulations set forth by the Clean Air Act appear to be particularly burdensome for biogas facilities.[28] On-site generation must meet Best Available Control Technology (BACT) standards for nitrogen oxide (NOx) emissions, which require more costly controls than other technologies. As low emission electricity generation technologies are relatively immature, there may be cost-reduction potential in the future. The CEC, in concert with project developers, has been exploring the development of such technologies and there is an opportunity to use the Electricity Procurement Investment Charge (EPIC) to develop these technologies.

In addition to air and water impact mitigation, preventing water contamination from solid waste discharge can entail additional capital costs for biogas.

Financing

Finally, the financing available to biogas project developers constrains industry growth. Private funding for digester development has been scarce and costly. Biogas is typically financed by equity investment, which entails an investor's rate of return (IRR) often in excess of 15 percent. In contrast, debt financing, often from commercial lenders, entails an IRR often between 7 to 10 percent. Since the cost of capital for biogas is much higher, project developers are forced to charge higher prices for biogas products.

To date, debt financing has been unavailable for biogas because of risk. This is due to both cost and regulatory barriers. Reducing risk and stabilizing both costs and revenues are key objectives for future biogas development.

ECONOMIC ANALYSIS

Deterministic Project Revenue Analysis

To understand the effect of prices on the feasibility of biogas projects, we undertook a financial analysis of four biogas technologies: a digester with on-site generation ("on-site digester," 1,000 cows, 100 kW), on-site digester with co-digestion (1,000 cows, 200 kW), biomethane for pipeline injection (10,000 cows), and a centralized biomethane facility (10,000 cows, nine facilities).[29] Our analysis was based on a 2011 analysis by ESA Associates, which was sponsored by the CRWQCB-CVR. For technical assumptions and base cost projections, please consult the ESA report.[30]

Methodology

ESA's analysis includes detailed estimates of costs and productivity for several different digester technologies. It also includes a cash-flow analysis that identifies profits and sufficient revenues to ensure adequate profitability.[31] The target IRR was set between Prime + 12 percent and Prime + 15 percent.[32]

Using ESA's results as a base case, we were able to probe the effect of carbon offset and electricity prices on yearly project revenues, which are largely driven by the sale of electricity and carbon offsets. We then compared these revenues with those ESA established as adequate to ensure profitability. In the results presented below, a revenue surplus of $0 (or 0 percent) or more indicates adequate profitability for the digester project. All values are in 2010 dollars.

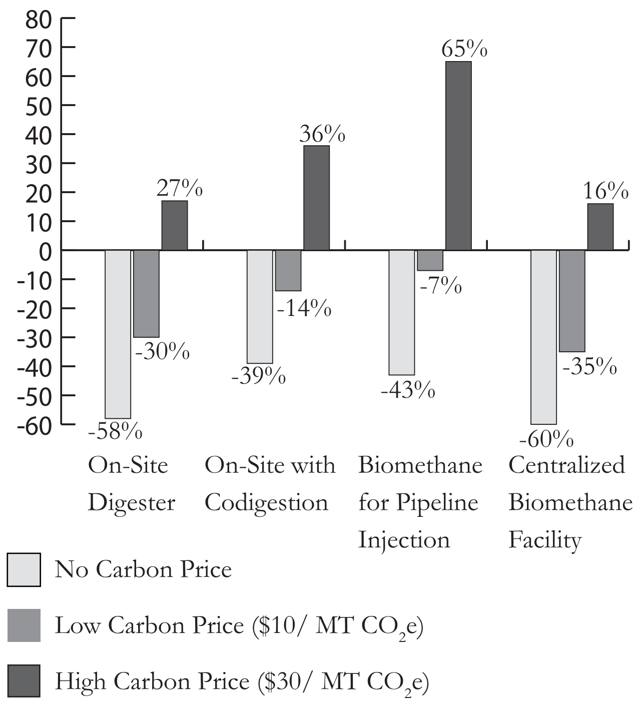
Assumptions for Carbon Offset and Electricity Prices. First, we looked at the revenues for three different carbon offset scenarios: No carbon price ($0/MT CO_2e), low carbon price ($10/MT CO_2e), and high carbon price ($30/MT CO_2e), with electricity prices fixed at the base case scenario. The low carbon price scenario assumes that offsets sell at the 2012 floor price for compliance permits (also known as allowances) under California's dap-and-trade program.[33] The high carbon price scenario, in contrast, assumes that allowance prices have reached the Allowance Price Containment Reserve price in the first year of California's cap-and-trade program[34] and that offsets are available at a discount of approximately 25 percent compared to allowances.[35] Offset prices are influenced by both supply and demand, and are subject to a wide range of uncertainty. Prices for offsets are also expected to increase over time as demand increases. This analysis ignores transaction costs, and assumes the full value of offsets sold is rewarded to the project developers.

Second, we examined revenues for three different electricity price scenarios: ESA's base case, a low compensation case, and high compensation case. All three scenarios are based on a net energy metering/net surplus compensation scenario.[36] In all cases, on-site generation was priced at $130/MWh. In the base case, excess generation was priced at $70/MWh. In the low compensation case, excess generation was priced at $40/MWh, which approximates the Default Load Aggregation Point (DLAP) price used for day-ahead forecasts without any additional environmental or renewable energy adders. Finally, in the high compensation case, all generation is priced at $130/MWh. This price has been identified in the recent Re-MAT decision as a price that might incent biogas generation and development.[37]

Results for Deterministic Analysis

Our results show that project revenues are highly sensitive to offset prices. Figure 2 shows the yearly revenue surplus or shortfall of four digester technologies at different carbon prices, presented as a percentage of required revenues for adequate profitability. In the no carbon price and low carbon price scenarios, no technologies achieve adequate profitability, though a centralized digester system falls only 7 percent below with offsets at $10/MT CO_2e. In the high carbon price scenario, all technologies are profitable, and approach a level that could be considered a windfall.

Figure 2: Yearly Revenue Surplus or Shortfall of Four Digester Technologies[38]



Next, we found the target offset price for each technology to achieve adequate revenues (that is, the price such that the difference between actual and required revenues was $0). Target prices ranged from $11.99 to $23.72/MT CO_2e, as shown in Table 2.

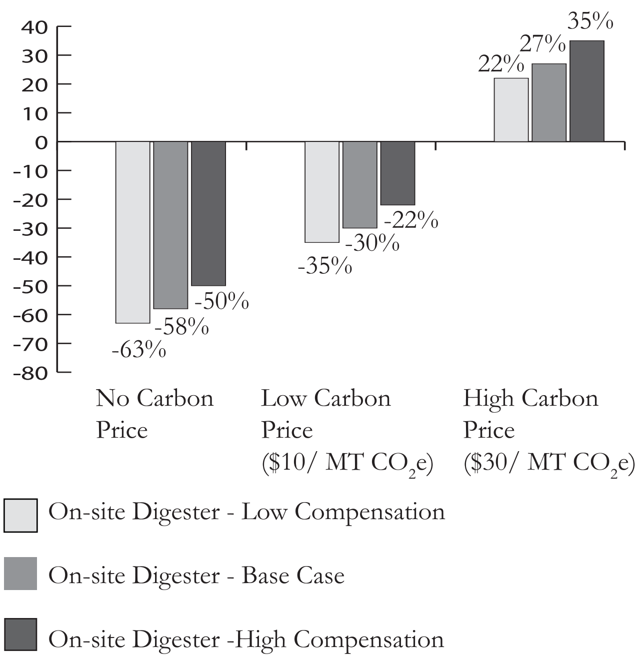
Table 2: Target Offset Prices

(Carbon offset price required for adequate revenues for four digester technologies)

Technology	Target Offset Price (2010$/MT CO_2e)
On-Site Digester (1,000 cows, 100 kW)	20.40
On-Site Digester with Co-Digestion (1,000 cows, 200 kW)	15.71
Biomethane for Pipeline Injection (10,000 cows)	11.99
Centralized Biomethane Facility (10,000 cows, 9 facilities)	23.72

Next we examined the impact of electricity prices on project revenues. We found that project revenues are less sensitive to electricity prices than carbon prices. As shown in Figure 3, revenues only vary by 13 percent between the low compensation scenario and high compensation scenario, while revenues vary by 85 percent between the no carbon price and the high carbon price scenarios. Values shown in Figure 3 are for on-site digester technology. From this analysis we found that carbon price affects revenues more than electricity price, a result that is consistent among all modeled technologies.

Figure 3: Yearly Surplus or Shortfall in Revenues for On-site Digester for All Carbon Offset Scenarios[39]



As project revenues are less sensitive to electricity price than carbon offset price, "target" electricity prices are generally outside the bounds of existing renewable prices in California. For example, the electricity price that would achieve adequate revenues for an on-site digester in the absence of a carbon offset price is $0.306/kWh or $306/MWh. Comparatively, the 2011 Market Price Referent (MPR) ranges from $76/MWh to $123/MWh for ten to twenty-five year contracts coming online between 2012 and 2020.[40]

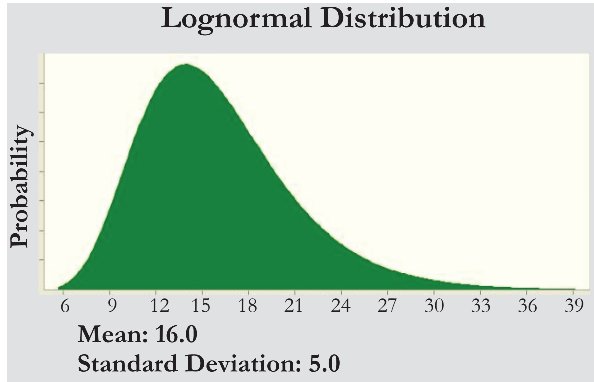
Probabilistic Project Revenue Analysis

Next, we expand our financial analysis of biogas technologies to simulate revenues with uncertain carbon offset and electricity prices.

Methodology

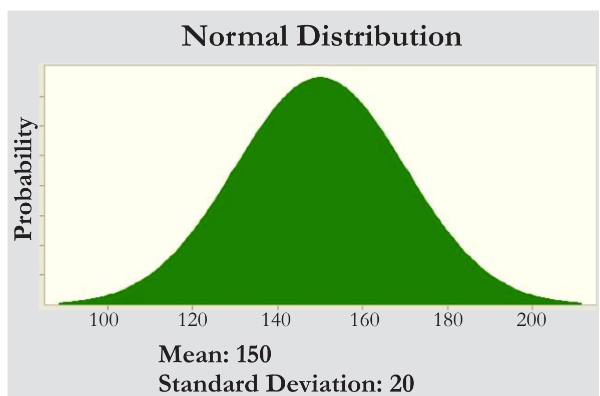
For each of the four technologies discussed above, we undertook a Monte Carlo analysis of revenues based on an assumed probability density function (PDF) for carbon offset prices. We chose a lognormal distribution with mean of \$16/MT CO_2e, and standard deviation of \$5/MT CO_2e. We believe the lognormal distribution represents well the non-negligible chance of very high carbon offset prices (in excess of \$30/MT CO_2e) without assigning too high of a probability to this outcome. All analysis was performed using the Crystal Ball module in Microsoft Excel. The PDF for carbon offset prices is shown in Figure 4.

Figure 4: Assumed lognormal distribution for carbon offset price



Following this, we performed a Monte Carlo analysis of yearly revenues under both electricity price and carbon offset price uncertainty for the on-site digester technology. Here, the electricity price was set at a mean of $150/MWh, with a standard deviation of $20/MWh. While these prices are higher than that offered to most other electricity generation in California, it is a likely price given recent legislative action to create standard offer contracts for bioenergy generation in California as part of a "carve out" to the state's Renewable Portfolio Standard Program.[41] The CPUC and others are currently determining this administratively set electricity price. As such, project developers face uncertainty when planning future biogas projects.

Figure 5: Assumed normal distribution for electricity price under recent legislative changes



Results of Probabilistic Analysis

For on-site digester technology, we see that revenues vary widely based on carbon prices. Sufficient yearly revenues for adequate profitability are approximately $250,000 for an on-site digester, but mean revenues are $35,000 short of that benchmark (see Table 3 and Figure 6 for the results of the simulations).

Figure 6: Revenue surplus or shortfall, compared to required revenue, for on-site digester with carbon offset price uncertainty

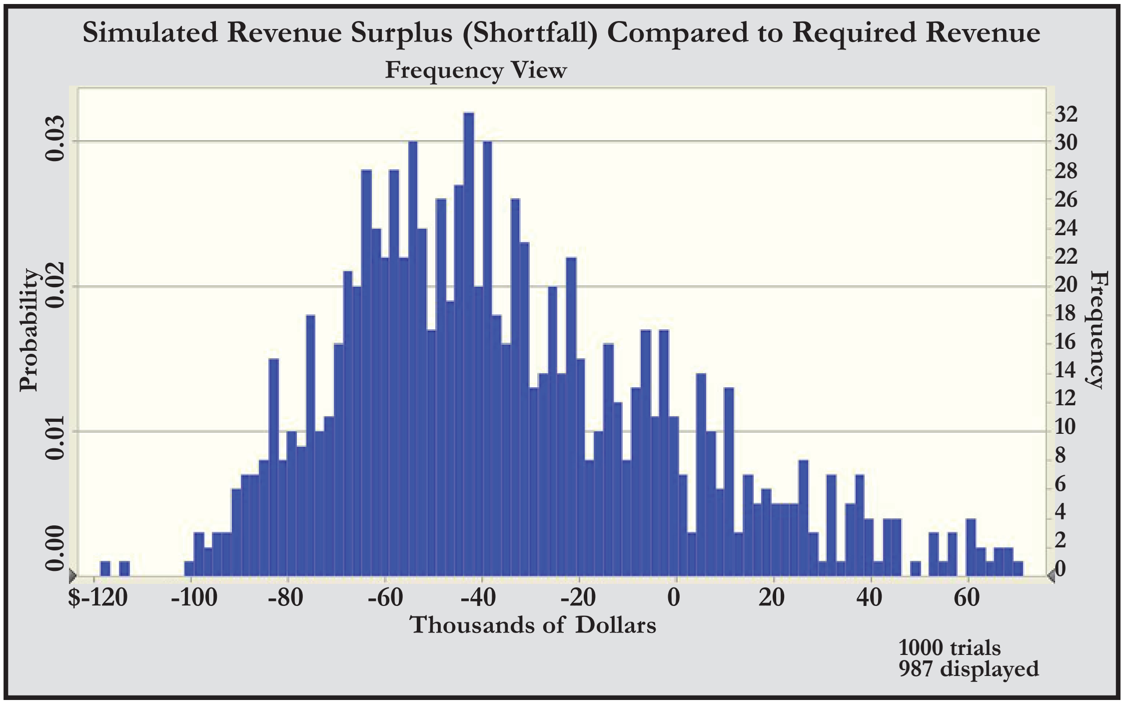


Table 3: Simulation Results for Uncertain Offset Price
($, Rounded to nearest thousand)

Mean (Deviation from Required Revenues)	-35,000
Standard Deviation	37,000 (~15% of target)
Maximum	112,000
Minimum	-119,000

Table 4: Simulation Results for Uncertain Offset and Electricity Price
(Rounded to nearest thousand)

Mean (Deviation from Required Revenues)	4,000
Standard Deviation	40,000
Maximum	164,000
Minimum	-91,000

This result further confirms the dependence of project revenues on carbon offset prices, and suggests policies that create price stability for project developers are important going forward.

When facing both electricity and carbon offset price uncertainty, we see two main results: First, the mean revenue surplus increases, as contracted electricity prices have been increased. Second, the standard deviation increases, but by less than 10 percent of its previous value. The small magnitude of the effect of this change is likely for two reasons. First, the PDF of electricity prices has smaller standard deviation (is "tighter") than the PDF of offset prices. Second, as the effect of electricity prices is smaller than offset prices, introducing randomness into the sampled value has a correspondingly smaller effect.

In conclusion, both our deterministic and probabilistic analyses confirm that project revenues for biogas projects are very dependent on carbon offset prices. Moving forward, policies that promote price stability, including long-term contracts and futures markets, will help the biogas industry to grow and stabilize.

RECOMMENDATIONS

There are several opportunities to encourage the cost-effective development of biogas in California. Several actors, from CARB and the CPUC to project developers themselves, can make biogas cost-effective while protecting ratepayers.

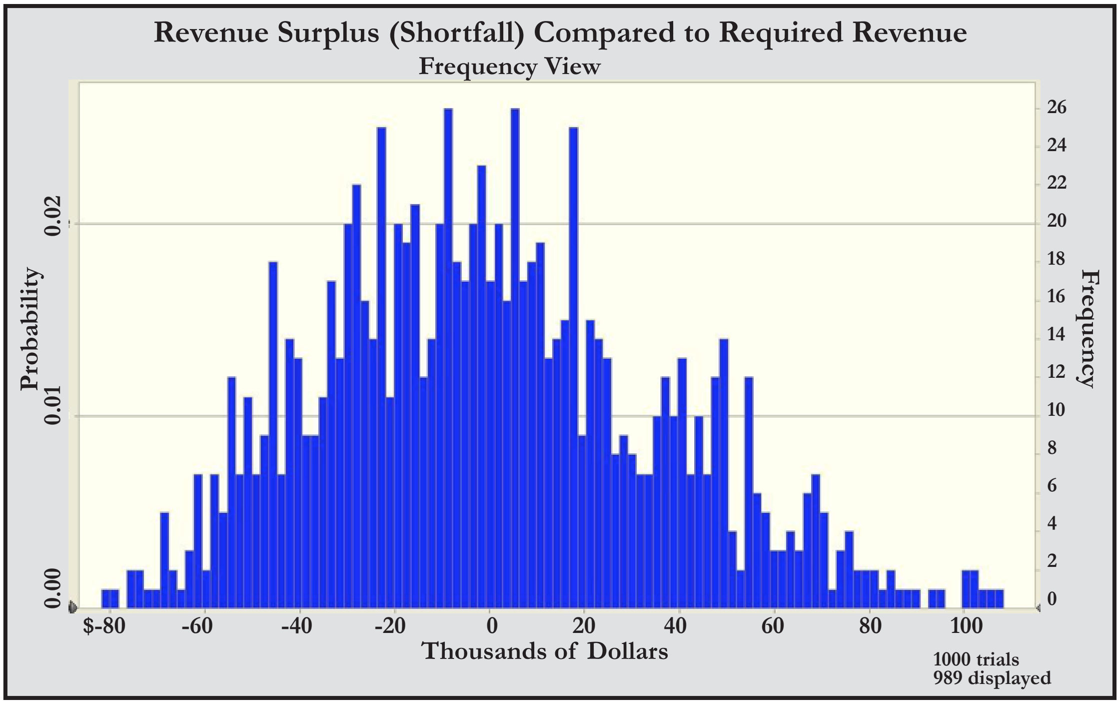
Recommendations for Biogas Developers

Our analysis above indicates several opportunities to improve the profitability of biogas projects. Additionally, our economic analysis shows that increasing revenues or decreasing costs is an important goal for biogas developers.

Balancing Economies and Diseconomies of Scale

Biogas projects are fixed in size due to their resource potential, which is based on the number of cows at a dairy farm. Most projects, however, are smaller than ideal for either grid interconnection or pipeline injection. Interconnection,

Figure 7: Revenue surplus or shortfall, compared to required revenue, for on-site digester with carbon offset price and electricity price uncertainty



conditioning, upgrading, and injection facilities all exhibit economies of scale. As a result, biogas can benefit from centralized upgrading or interconnection facilities. At the same time, transportation, both of feedstock or biogas, exhibits diseconomies of scale. While balancing economies and diseconomies of scale is site-specific, understanding these tradeoffs is important to reducing costs.

Learning by Doing

While digester cost reduction is likely to be incremental (see Section 4.2.4), it is likely that cost reductions can be achieved from "learning by doing." Learning by doing refers to a productivity increase (or cost decrease) as the result of repetitive action. Given the complexity of constructing and operating a dairy digester, it is likely that firms and project developers will be able to bring down costs through increased deployment. Enabling information exchange will also help build technical, regulatory, and financial expertise within the dairy digester industry.

Technology for On-Site Generation

On-site generation technology that meets BACT specifications include internal combustion engines with add-on NOx control (such as selective catalytic reduction), microturbines, and fuel cells. These technologies have varying degrees of commercial viability and can be improved by further research, development, and deployment (RD&D). In addition to using EPIC funds for biogas RD&D, the California Bioenergy Working Group can convene experts to discuss purchasing and operation decisions, bringing down the cost of on-site generation in non-attainment areas.

Productivity Increase

Increasing productivity can increase the revenues that a biogas project receives. Co-digestion offers one method for boosting productivity of dairy digesters. Our financial analysis in Figure 2 demonstrates that revenues are consistently higher for digesters with on-site generation employing co-digestion than for digesters without co-digestion. While additional capital requirements are minimal, co-digestion may require additional effort to comply with water quality and solid waste regulations. Co-digestion may also be limited by the existence of suitable supply chains. Where feasible, this technique should be employed.

Other Revenue Increases

Aside from carbon offsets and productivity increases, projects can increase revenues through digestate by-products, effluent, tipping fees, and renewable energy credits.[42] These revenues are created through additional economic transactions by the project developers, including sale of by-products or collection of fees for waste removal. ESA Associates, after estimating the value of these products, believes they will not have a large effect on profitability.[43]

Other Opportunities for Offset Revenue

Finally, biogas project developers can sell to other entities aside from California's investor-owned-utilities (IOUs). Quebec and California are considering linking their two cap-and-trade programs under the Western Climate Initiative, which could potentially make California biogas offsets eligible for compliance in Quebec. Developers can also sell their offsets to other covered entities under California's cap-and-trade regulations, including public-owned utilities, municipal utilities, electrical service providers, and industrial sources, which do not have the same restrictions for offset purchases as the three IOUs.

Policy Recommendations

Our financial analysis shows that carbon offsets are a "game changer" for the revenues of biogas projects. While existing voluntary offset prices are generally too low to affect profitability, compliance offsets under California's cap-and-trade program may achieve prices necessary to allow financial feasibility.

While offset revenues can greatly enhance financial feasibility for biogas projects, price risk and regulatory risk relating to offsets can lessen their ultimate benefit to project developers. Notably, price volatility due to the absence of long-term contracts influences a biogas developer's ability to attract finance, even with enhanced revenues. The success of biogas in California will therefore rely on a liquid and stable carbon offset market. Below, we make several recommendations for developing such a market.

CARB Implementation

While CARB has assembled guidance documents for agricultural livestock offsets, there will likely be certification and implementation issues relating to these offsets. All compliance offsets under California's cap-and-trade program require third party verification before CARB can issue any offsets. These verifiers must also be accredited by CARB.

CARB should ensure that there are a sufficient number of certified verifiers, and that offset transaction costs are kept low to maximize revenues. In the absence of a large pool of certified verifiers, it is possible that verifiers may extract excess profits from offset project developers, including biogas projects. As of spring 2012, CARB had taken action to accredit several third-party offset verifiers.[44] As of March 2013, sixty-eight verifiers had been accredited, while thirty were specifically accredited to evaluate livestock projects.[45] CARB should continue to monitor this market to make sure there is adequate competition.

CPUC and Procurement of Offsets

The CPUC regulates how California's IOUs procure carbon offsets under the long-term procurement planning proceeding. To date, the CPUCs' rules on carbon offset procurement by the IOUs could potentially limit the emergence of market instruments that would promote price stability and long-term revenues for carbon offsets. This includes not allowing long-term offset procurement contracts and a ban on any offset transactions outside of the competitive request for offer (RFO) solicitation process.[46]

In particular, two changes could be made to the IOUs' authority to procure carbon offsets that would increase revenue certainty for biogas project developers and unlock more avenues to project finance:

1) Authorize the IOUs to purchase carbon offsets through long-term contracts. This would promote price stability and minimize transaction costs.
2) Authorize the IOUs to purchase carbon offsets from bundling brokers outside of the competitive RFO process, but only in limited cases. This could prevent unnecessary price spikes during true-up periods.

Consideration of Offset Revenue in RPS Procurement

Under SB 1122, electrical corporations in California are compelled to purchase electricity from bioenergy projects. However, the CPUC has authority to determine the terms of standard offer contracts for such bioenergy projects, including electricity prices. As revenues from carbon offsets are likely to be a key contributor to profits for biogas project developers, any attempt to determine standard electricity prices should consider the effect of any offsets produced by the project on profitability for the biogas producer. Similarly, utilities charged with soliciting and evaluating projects for RPS compliance should consider carbon offset revenues as part of project evaluation. The CPUC is considering how to implement SB 1122 and other biogas legislation under Rulemaking 11-05-005.

Continue Information Exchange

A large part of cost reduction for biogas will come from "learning by doing." As such, information exchange is an important tool for sharing this learning with other industry stakeholders and encouraging cost-effective development of in-state biogas from dairy digesters.

California has set in place several mechanisms to support the growth of bioenergy, including RD&D funding through EPIC funds and the Interagency Bioenergy Working Group. We believe the CEC and other groups should continue to employ best practices and identify cost-effective opportunities. California should seek other avenues for information exchange and other learning-by-doing opportunities.

Conclusion

Despite modest potential and substantial co-benefits, biogas development in California has not met expectations. This is due to a number of barriers, including cost, regulatory, and financing hurdles. Provided that technology can be developed to limit air emissions, biogas is a strong candidate to provide baseload and peaking renewable generation in California.

After considering revenues from compliance carbon offsets under California's upcoming cap-and-trade program, biogas may be cost-competitive with other renewable technologies. Still, significant hurdles remain to commercializing and financing reliable and low-emission biogas technology. We urge policymakers and project developers to consider the recommendations of this report when taking future action to develop biogas in the state.

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This report is based on the research by the Division of Ratepayer Advocates (DRA) staff and is not the official position of DRA.

ENDNOTES

[1] California Environmental Protection Agency, "History: Anaerobic Digesters at Dairies in California," http://www.calepa.ca.gov/Digester/History.htm (accessed March 14, 2012).

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[3] Other estimates place statewide nameplate capacity potential for biogas at 400 megawatts (MW) for baseload generation and up to 1,250 MW for peaking generation. Source: Neil Black of California Bioenergy, personal communication.

[4] Anna Austin, "Methane Migraine," Biomass Power and Thermal (January 2010), accessed at http://biomassmagazine.com/articles/3377/methane-migraine.

[5] Bramley et al., "Agricultural Biogas in the United States," 70. These each provide roughly one MW of capacity.

[6] CA Biomass Collaborative, Facilities Database, accessed at http://biomass.ucdavis.edu/tools/#facilities-data.

[7] For further discussion, see California Energy Commission, "Notice to Consider Suspension of the RPS Eligibility Guidelines Related to Biomethane," 2012, accessed at http://www.energy.ca.gov/portfolio/notices/2012-03-28_biomethane_notice/2012-03-28_Biomethane_Suspension_Notice.pdf.

[8] Assembly Bill 2196, Chesbro, Chapter 605, Statutes of 2012

[9] California Energy Commission, "Renewables Portfolio Standard Eligibility, Staff Draft Guidebook," 2013, available at http://www.energy.ca.gov/2013publications/CEC-300-2013-005/CEC-300-2013-005-ED7-SD-marked.pdf.

[10] "California Energy Commission Suspends RPS Eligibility of Biomethane," Wilson Sonsini Goodrich & Rosati, Professional Corporation, April 9, 2012.

[11] Biogas projects receiving additional special incentives, such as the Self Generation Incentive Program (SGIP), are not eligible for the FiT.

[12] See, for example, Database of State Incentives for Renewable Energy, California Feed-in Tariff, http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CA167F&re=1&ee=1&printable=1.

[13] Senate Bill 1122, Rubio, Chapter 612, Statutes of 2012.

[13] CA Public Utilities Commission, "Net Surplus Compensation (AB 920)," 2009, http://www.cpuc.ca.gov/PUC/energy/DistGen/netsurplus.htm (accessed July 3, 2012).

[13] Senate Bill 1122, Rubio, Chapter 612, Statutes

of 2012.

[14] CA Public Utilities Commission, "Net Surplus Compensation (AB 920)," 2009, http://www.cpuc.ca.gov/PUC/energy/DistGen/netsurplus.htm (accessed July 3, 2012).

[15] CA Air Resources Board, Cap-and-Trade Program, available at http://www.arb.ca.gov/cc/capandtrade/capandtrade.htm[13] Senate Bill 1122, Rubio, Chapter 612, Statutes of 2012.

[16]"California carbon flatlines at $14 as state dithers on Quebec link-up," Point Carbon, http://www.pointcarbon.com/news/1.2223124 (accessed March 15, 2013).

[17] For detailed methodology, see CA Air Resources Board, Compliance Offset Protocol Livestock Projects: Capturing and Destroying Methane from Manure Management Systems, http://www.arb.ca.gov/regact/2010/capandtrade10/coplivestockfin.pdf (accessed October 20, 2011).

[18] "California lists first carbon offset projects for CO_2 market," Carbon Market North America 8:11, http://www.pointcarbon.com/polopoly_fs/1.2224278!CMNA20130315.pdf (accessed March 15, 2013).

[19] Levelized Cost of Energy (LCOE) is the constant unit cost of a payment stream that has the same present value as the total cost of building and operating a generating plant over its life. It is a useful metric for understanding the cost of electricity from a generator.

[20] Nicholas Cheremisinoff, Kathryn George, and Joseph Cohen, "Economic Study of Bioenergy Production from Digesters at California Dairies," CA Energy Commission Public Interest Energy Research Program, CEC-500-2009-058.

[21] Data from Ibid., 20.

[22] California Regional Water Quality Control Board, Central Valley Region, "Economic Feasibility of Dairy Manure Digester and Co-digester Facilities in the Central Valley of California," prepared by ESA Associates, May 2011.

[23] For a more complete discussion of the cost factors affecting economic feasibility, see Ibid.

[24] INO.com Markets: Natural Gas (NYMEX:NG), http://quotes.ino.com/exchanges/contracts.html?r=NYMEX_NG (accessed March 18, 2013).

[25] Cheremisinoff et. al., 27.

[26] See, for example, PG&E Rule 21, available at http://www.pge.com/tariffs/tm2/pdf/GAS_RULES_21.pdf; and SoCalGas Rule 30, available at http://www.socalgas.com/documents/business/Rule30_BiomethaneGuidance.pdf.

[27] California Regional Water Quality Control Board, Central Valley Region, 99.

[28] Austin, 2010.

[29] Co-digestion refers to the anaerobic digestion of multiple biodegradable feedstocks. This increases production of by adding substrates that produce much more biogas per unit mass than the base substrate, manure.

[30] California Regional Water Quality Control Board, Central Valley Region.

[31] California Regional Water Quality Control Board, Central Valley Region, 2-1.

[32] A prime rate is the interest rate charged by banks to their most creditworthy customers. "Prime +" reflects an increased rate to reflect increased risk.

[33] California Air Resources Board Final Regulation Order, Appendix E: Setting the Program Emissions Cap, E-16.

[34] California Air Resources Board Final Regulation Order, Appendix E: Setting the Program Emissions Cap, E-16.

[35] California's Allowance Price Containment Reserve exists to provide a "safety valve" to the allowance price and help to mitigate volatility in allowance prices.

[36] See CPUC decision 11-06-016.

[37] See CPUC decision 12-05-035, 47.

[38] Prices of \$30/MT CO_2e exceed revenues required for adequate profitability (defined as 0 percent).

[39] Shows no carbon price, low carbon price, and high carbon price and all electricity price scenarios (low compensation, base compensation, and high compensation).

[40] The Market Price Referent approximates the "avoided cost" of new generation in California. It is currently defined as the long-term ownership, operating, and fixed-price fuel costs for a new 500 MW natural gas-fired combined cycle gas turbine (CCGT). See Resolution E-4442, December 6, 2011, 2.

[41] For more information, see Senate Bill 1122, Rubio, Chapter 612, Statutes of 2012.

[42] Tipping fees are payments to biogas producers employing co-digestion for disposal of organic waste. Digester effluent is applied to fields to enhance crop production.

[43] California Regional Water Quality Control Board, Central Valley Region.

[44] "Air Resources Board sets stage for carbon offset projects," CA Air Resources Board, available at http://www.arb.ca.gov/newsrel/newsrelease.php?id=376.

[45] Data from Offset Verification Program, CA Air Resources Board, available at http://www.arb.ca.gov/cc/capandtrade/offsets/verification/verification.htm.

[46] For a full discussion of limitations on offsets see LTPP Track I & III Decision 12-04-046.

[47] Recent legislative changes may limit biogas and biomethane producers' ability to claim greenhouse gas reductions. At the time of publication, the effect of these legislative changes is unclear. See Assembly Bill 2196, Chesbro.