September 12, 2009

Adaptation
Natural Resources Agency
1416 Ninth Street, Suite 1311
Sacramento, CA 95814

Re: 2009 California Climate Adaptation Strategy Discussion Draft

It is exciting that California is putting in place a comprehensive Climate Adaptation Strategy to examine how state agencies can respond, because planning of this scope and breadth is so very needed.

However climate change is not the only issue which will bring sweeping transformation to every aspect of our lifestyles. At the same time as we are implementing adaptation to climate change, we will be experiencing the repercussions of peak oil. **Peak oil will severely limit the options open to us as we adapt to climate change.** As we make plans for the future, any realistic plans must include climate change and peak oil combined.

ENERGY SUPPLY PROJECTIONS

The future projections in the Adaptation Strategy (Page 15 to 21, Section II) must include Energy Supply projections.

"Peak oil" is the understanding that the earth's fossil energy supplies are finite, and that humanity is currently at the half-way point of consuming those finite supplies.[1]

By the forecasts of most international scientists, we are at or past the "peak" of planetary oil supplies. We are nearing the peak of natural gas supplies. International demand for oil and gas will outstrip supply within six years, according to Royal Dutch Shell chief executive Jeroen van der Veer.[2]

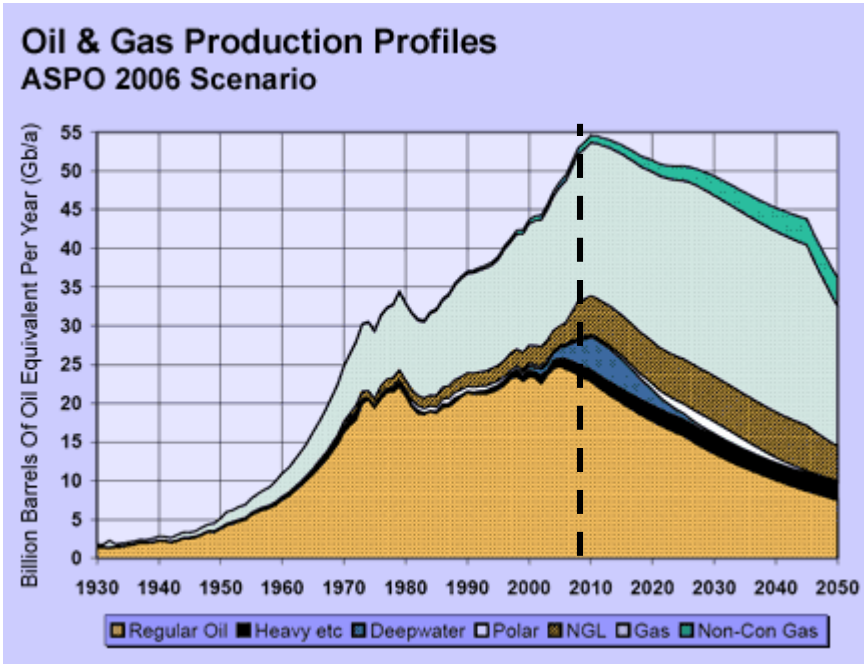
For the past 150 or so years, oil has been cheap, abundant, and in constant supply. All of the exponential growth we have experienced in the past half century has been based on oil, and our demand for it has only increased.

But "the era of easy oil is over," says Dave O'Reilly, Chevron CEO.[3] And because we have already used up the easy-to-get-to stuff, the second half of our planetary supply will cost a lot more.

Peak oil affects every aspect of our lives from food to transportation to health care to California's water resources. As oil becomes less cheap and less abundant, we will no longer be able to transport goods long distances (shipping, importing, long-haul trucking). We will no longer be able to grow our food far away from population centers where people live. Without cheap, abundant fossil fuels, we will no longer be able to transport ourselves around the planet in the ways many of us have taken for granted as "normal" (tourism, cheap airflights). Many fossil-dependent industries will cease to be viable.

As we experience the repercussions of peak oil, we will see extreme volatility in oil prices. We're experiencing volatility already with $147 in July 2008, $30 in Dec. 2008, and $74 in Aug. 2009. We can expect to see supply interruptions and shortages. These will drive further upheaval in an already crumbling business environment. We can expect to see further job losses as well as constriction of government revenues.

We will enter into energy-scarcity at exactly the same time as we experience the deepening impacts of climate change. If we do not prepare our citizens for this dual crisis – if we enter into it without petroleum-free infrastructure and without citizen awareness – we are likely to experience civil unrest, upheaval, and even war.



Oil and natural gas production

Biofuels are not the answer. To produce 1.75 units of biofuel, requires the investment of 1 unit of fossil-based energy in the form of petrochemicals for agriculture, shipping, and processing.[4] (1:1.75) At this poor ratio we have made no forward steps. The United Nations Secretary-General has called biofuels "a crime against humanity" because we do not have sufficient land, worldwide, to grow crops to feed both cars and people.[5]

Nuclear is not the answer. It takes enormous inputs of fossil fuels to keep nuclear energy production processes safe and secured[6], and we have no responsible solution to the issue of nuclear waste[7] (which also demands fossil fuels to secure). Additionally, we are facing peak uranium.[8]

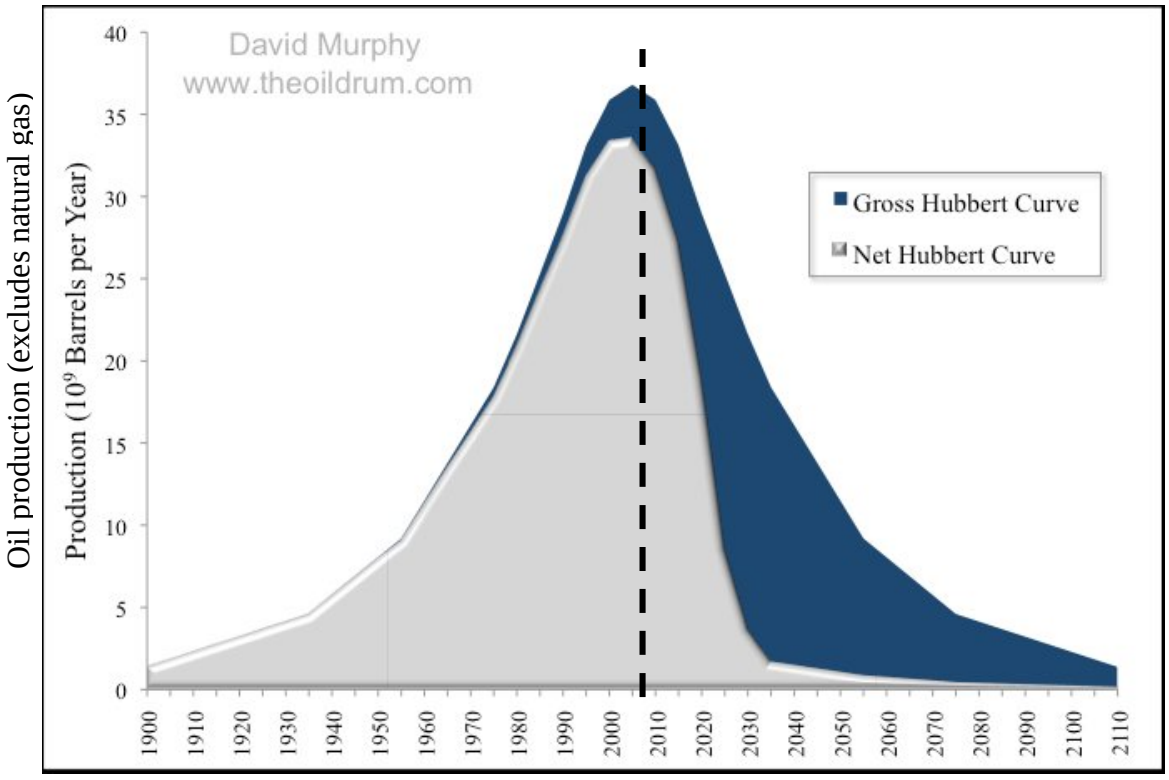
> "4.2 billion. That's how many rooftops you'd have to cover with solar panels to displace a cubic mile of oil (CMO). ... The world consumes a little over 1 CMO of oil a year right now and about 3 CMOs of energy from all sources."
>
> ---Michael Kanellos, CNET News, paraphrasing Ripudaman Malhotra

Coal is sometimes touted as "clean" by its lobbyists, but "no power plant is yet operating with a full carbon capture and storage system."[9] Furthermore, NASA's James Hansen and his team at Columbia University say "coal reserves are highly uncertain, but the reserves are surely enough to take atmospheric CO2 amounts far into the region that we assess as being 'dangerous.' Thus we must only consider scenarios in which coal use is phased out as rapidly as possible."[10]

Renewable energy can never hope to replace the vast power and energy density that fossil fuel has given us for this brief period of human history.[11] Ripudaman Malhotra and his team have calculated that renewables, even if we installed them at mind-boggling construction rates, can only supply a bare fraction of our current demand. [12],[13]

A concept known as "Energy Returned on Energy Invested" or EROEI may make cause the end of the oil age to be felt quite suddenly. EROEI is the amount of oil that must be invested (in drilling equipment, shipping, running refinery equipment, etc) in order to get new oil.

In the early days of the oil boom, the oil industry could invest 1 unit of oil and get back 100 units of oil. (1:100) Now we have already consumed the easy-to-get-to stuff, and the petroleum industry is working deepwater and polar fields where it is much more difficult and expensive to extract the oil. For an investment of 1 unit they only get back 11 units of oil.[14] (1:11) The net oil available for our future uses might be far less than the detailed ASPO diagram above would indicate.



A simplified drawing of the peak oil curve taking EROEI into consideration.[15]

David Murphy's diagram reveals that although there still remains oil in the planet for us to extract, the dramatically increasing EROEI cost of doing so means we'd better be ready to deal with a society with essentially *no oil within the next 20 years.*

Thus our only realistic option is reducing our energy demands quite sharply to bring our energy use within the realm which renewables can supply. This is sometimes called ***power down***. Powering down reaches far beyond mere "conservation" or "efficiency," into changing to lifestyles and operational methodologies which require far less power overall. Powering down includes relocalizing (reducing the distances over which we transport goods and people) and integrating mechanical, power-free tools and devices.

Even as we invent mitigations and adaptations to climate change, we must power down our society. Thus any realistic intermediate-term mitigation or adaptation strategy must consume less oil and less fossil

resources overall. Any long-term mitigation or adaptation strategy must be designed to operate *petroleum-free* in the severely constrained energy supplies of the future.

Any short-term mitigation or adaptation strategy must constitute a wise use of our remaining oil supplies, a wise investment of our remaining planetary oil. *This investment must better prepare us for life beyond the oil age.*

Forward-thinking cities like Ventura, California,[16] San Francisco, California,[17] and Portland, Oregon[18] have created plans for their transition to a post-petroleum future. As California prepares a Strategy document to plan our adaptations to the coming threats of the future, it is imperative that this Adaptation Strategy reflect energy constraints and help reorient our state for the post-petroleum future.

> "One day we will run out of oil. We have to leave oil before oil leaves us, we have to prepare ourselves for that day. The earlier we start, the better, because all of our economic and social system is based on oil, so to change from that will take a lot of time and a lot of money and we should take this issue very seriously."
>
> -- Dr Fatih Birol, the chief economist at the respected International Energy Agency (IEA) in Paris, which is charged with the task of assessing future energy supplies by OECD countries.[19]

Thus **climate change and peak oil, combined,** must be an integral part of any realistic long-term plan. We must ensure that climate change mitigation and adaptation efforts also prepare our citizens for a post-oil culture. As we spend public funds on climate adaptation, mitigation, and planning, those same funds must also further our peak oil readiness.

<u>Climate adaptation plus peak oil adaptation</u>

Just as your Adaptation Strategy Discussion Draft (Figure 4, page 14) delineates the complementary and conflicting actions between adaptation and mitigation efforts, a similar analysis applies to the interrelation of peak oil and climate change.

Many seemingly "favorable" actions for climate change adaptation rapidly become *unfavorable* actions when peak oil is taken into consideration. Examples from your Figure 4, page 14:

- Meeting Peak Energy Demand with Fossil Fuels becomes "Unfavorable for Adaptation and Mitigation Efforts" when peak oil is considered.
- Wastewater Recycling and Desalinization becomes "Unfavorable for Adaptation and Mitigation Efforts" when peak oil is considered, because desalinization and large-scale offsite wastewater recycling are both highly-energy intensive processes.
- Increased Air Conditioner Use becomes "Unfavorable for Adaptation and Mitigation Efforts" – the idea is almost laughable in an era of limited energy supplies.
- Energy Demand Management becomes "Favorable for Mitigation but Unfavorable for Adaptation Efforts" when peak oil is considered. The appropriate listing under "Favorable for Adaptation and Mitigation Efforts" would be *Energy Demand Reduction*, also known as *Power Down.*
- Energy Efficient Buildings is an inadequate description. Given that we face a limited-energy future, we need to retrofit all existing buildings and mandate that new construction include

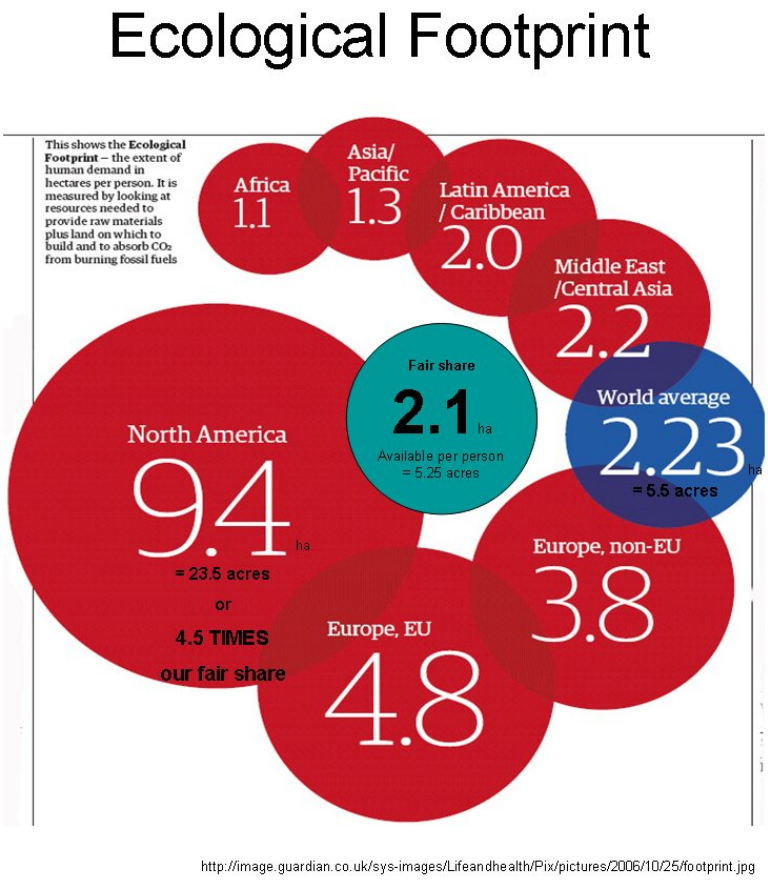
passive solar attributes for *Energy-Free Operation* (such as heavy insulation, site orientation to maximize/minimize sun exposure, operable windows, cross ventilation, daylight, deciduous shade trees, and effective window coverings). Other aspects of energy-free operation include height restrictions to eliminate need for elevators, pedestrian- and bicycle-focused design, and city footprints designed to drastically reduce transportation needs.

- Water Conservation addresses only one small aspect of the problem: water uses. We must also consider water sources, and reorient our attitudes about so-called "waste" water. We must change our societal paradigm about water; we must embrace *Water Wisdom.*
- Biodiversity-Oriented Forestry will be inadequate under peak oil challenges if it doesn't include food production close to and within population centers.
- "Smart Growth" is a term which is inappropriate in Fig. 4 in any column. For a post-petroleum world we must *reorient our expectation of growth*, overall. Any growth which increases demand for fossil-based infrastructure is Not-Smart. New development which furthers our adaptation to the dual crisis of climate change AND peak oil is the only "Smart" type of development. But overall, we will more likely find our economic horizons to be shrinking rather than growing, because the laws of physics dictate that we must return to some sense of planetary fairness as described below.

ECONOMIC PROJECTIONS

The future projections in the Adaptation Strategy (Page 15 to 21, Section II) must include Economic projections because the entire climate change and peak oil adaptation process will have to be achieved in the midst of the largest economic downturn in modern history.

As we stated previously, all of the exponential growth we have seen in the past 50-100 years has been fueled by fossil energy. In that environment, we have come to believe that growth is unlimited, simply because since the late 1860s we've seen nearly constant growth.



http://image.guardian.co.uk/sys-images/Lifeandhealth/Pix/pictures/2006/10/25/footprint.jpg

But with the peaking of oil production, our society's growth potential has similarly peaked. The current economic "recession" will continue, even as we progress with adaptations and mitigations to the dual crisis of peak oil and climate change.

A January 2009 gathering of the foremost global political and business leaders at the World Economic Forum at Davos spoke of "Depression 2.0"[20] International long-range forecasters understand that the pause some people are hopefully calling "recovery" is only a resting place on the way down.

This is understandable when we consider the concept of *global footprint.* If we take all the resources on the planet – all the soil, water, trees, fisheries, fuel, resources, etc. – and divide them up by the number of people currently on earth, we arrive at a figure of about 4.5 bioproductive acres per person, our *fair share.*

North Americans currently consume the equivalent of 24.7 bioproductive acres, about 5 times our fair share. If everyone on the planet consumed the way we do – the way we tell ourselves is a "normal" lifestyle – it would take FIVE PLANETS to provide for it all.

We don't have six, seven, or eight planets with which to "grow the economy." We have reached the limits to growth – indeed, we have overspent those limits, but that overspending is now being readjusted on the front pages of financial pages in plummeting economic indicators, lost jobs, and closing industries.

While some financial analysts may futilely scan for any scrap of hope of a "recovery," the basic laws of physics indicate that we will see only *economic contraction* into the long term future. Thus all plans for climate change and peak oil adaptation will take place within an environment of ongoing economic contraction.

With the understanding that peak oil and economic contraction go hand-in-hand with climate change mitigation and adaptation, let us review the strategies and actions listed in the Adaptation Strategy Discussion Draft.

HEALTH ADAPTATION STRATEGIES AND ACTIONS

Community Resilience:

Page 41 Strategy 1a and Page 23-24 Strategy 1: **Integrate climate AND peak oil resiliency**. For any solution to be viable, it must tackle both peak oil and climate change *simultaneously*. Considering climate change in isolation, without the impacts of peak oil and economic contraction, creates an unrealistic and impossible plan. Climate change plus peak oil combined dictate that we must grow resilient, self-sufficient local communities, not simply for health reasons, but for basic human survival.

Food security:

Page 41 Strategy1c: It is agreed that sustainable local food systems are essential to both reducing our carbon footprint and reducing our dependence on oil. However Strategy 1e casts this as a Long Term Action and seems to downplay the extreme seriousness of the situation:

Food Security for urban security. With the population concentration we have, particularly in our cities, *food security is basic to urban security.* That is because hungry people are the recipe for civil unrest. Many countries have already experienced food riots by hungry people, and the FAO warns that riots are likely again.[21] Hunger is already here: in the past year demand has increased at the Los Angeles Regional Food Bank by 34%, with a 24% increase in the past six months.[22] The Adaptation Strategy already acknowledges that relocalizing food production is a necessary climate adaptation, but peak oil and economic contractions dictate that we **jumpstart local urban food production immediately.**

Page 42 Strategy 1e: **Promote local urban food production in many forms** such as community gardens, backyard "Victory Gardens," edible schoolyards and churchyards, and corporate rooftops. Transporting food long distances generates copious greenhouse gas emissions. Additionally, in the future with less oil, we will no longer be able to import our food; we will need to grow it much closer to where people live. Educate communities to think in terms of "food feet" rather than "food miles."

Localizing food production must become a near term action rather than a long term one because our population currently doesn't know how to grow food. There is a significant learning curve before a gardener achieves true food-security-level success. [23] Conduct education programs in **organic vegetable gardening** for school educators and for the general public, with priority given to urban areas experiencing economic hardship.

Page 41 Strategy 1b and Page 24-26 Strategy 2, Land use: **Develop a funding strategy for and promote community gardens**, particularly within areas which are experiencing economic hardship. Consult with Urban Farming and other food justice organizations to obtain statistics and mapping of urban neighborhoods which have no access to fresh produce, and make sites in these neighborhoods a priority. Grow local self-sufficiency and community resilience as well as human health.

Health access:

Our current health care system is entirely dependent upon fossil fuels.[24] Many medical substances are transported horrific distances around the globe (with accompanying greenhouse gas emissions). Many of our current medications cannot be derived without energy-intense laboratories to distill and

produce them. High-tech tests and surgeries require lots of energy, and many medical devices are made of oil-derived plastics. In a post-petroleum future many of these will cease to be available.

Page 42 Strategy 1d: Conduct public programs that promote **fossil-free health care**. As we move into a climate change, energy-scarce future, we must embrace adaptations which allow us to care for sick people despite the lack of fossil-based energy. Health modalities which do not rely upon disposable items or rarified medications will be the most resilient. Examples include garden-to-medicine herbalism, some chiropractic practices, acupuncture and acupressure, and many more.[25]

Page 42 Strategy 1d: Develop public training in **the practice of home health care**. Many of the health issues for which people currently turn to health care providers could be handled effectively at home with techniques such as fresh food nutrition, productive work as exercise, and home remedies as first aid. In the not-to-distant past, the predominance of medical care was handled this way; in this brief era of energy excess, we have forgotten these basic skills. We must relearn these skills from remaining practitioners and disseminate the knowledge again.

Page 42 Strategy 1d, Page 44 Strategy 5b and Page 26-27 Strategy 3: Identify strategies and resources to **re-outfit first responder, trauma, and emergency care** for operations within a context of extremely expensive or very limited oil supplies.[26] How do we drive an ambulance without oil? What about a police car? Changing fleets over to "more efficient" vehicles under the auspices of climate change mitigation is futile when peak oil is taken into consideration. It takes 20 barrels of oil (with accompanying greenhouse gas emissions) to manufacture a vehicle. 12% of a vehicle's greenhouse gas emissions are created during its manufacture.[27] All of this expenditure on conversion is wasted unless it prepares for both of the crises we face. As part of adaptation, we must retool for the full reality of our future.

Page 42 Strategy 1d: Support policies which **promote access to family planning**, birth control, and education in reproductive choices. Establish policies, priorities, and actions that prevent further unplanned pregnancies and discourage large families. Many international scientists declare that our numbers are already passing the carrying capacity of the earth – the ability of the planet to support the human species.

Educate, Empower and Engage Citizens:

Page 42 Strategy 2a and Page 30-31 Strategy 5: **Educational Outreach for climate change and peak oil *combined***. As we spend public funds on climate adaptation, those same funds must further our peak oil readiness. The public needs to know what is coming and how to prepare. The list of vulnerable populations expands considerably when the twin crises are considered.

Oil price volatility and high food costs will bring extreme hardship to economically disadvantaged populations. Peak oil will drive further economic downturn and job losses, particularly within populations which are tied to fossil-intensive industries. Automobile, airline, trucking, shipping, heavy manufacturing, chain stores, industrial-style farming, and more, become "vulnerable populations" when peak oil is combined with climate change.

Page 42 Strategy 2: Develop training and education for **mental health professionals to cope with the emotional repercussions** of peak oil and climate change combined: massive lifestyle changes, job losses, business closures, industry collapses, disillusionment of life goals, and more.

Page 41 Strategy 1b: In order to build resilient communities, we need free places to gather the people of the community. In land use planning, promote increased access to **community gathering places** (public meeting rooms, town squares, farmers market spaces, parks, mini-amphitheaters) in every local neighborhood.

Page 45 Strategy 8a, Public health considered in all policy development: **Strengthen the California Global Warming Solutions Act of 2006** (Division 25.5, commencing with Section 38500, of the Health and Safety Code). Now that the Federal EPA has confirmed that California can indeed regulate greenhouse gas emissions at the state level, and with several states following California's lead, it is time for California to aggressively pursue this path. Develop enforceable regulations and develop a funding strategy for enforcement. Advise that violators receive strict financial penalties. Support policies that do not permit exceptions; exceptions to GHG caps mean permitting GHG pollution which jeopardizes the survival of all of us. Revise the emissions targets to make them more potent so that emissions are more rigorously curtailed, and advance the target dates so that we reduce our greenhouse gas output sooner.

OCEAN AND COASTAL ADAPATATIONS

Page 73 Strategy 2a: Additional questions should **ask whether protections require oil and fossil fuels to maintain on a long-term basis** (example: bulldozers and cranes for annual seawall maintenance). If such fossil-dependent maintenance is required for long-term protection, then that "protection" is unworkable because we won't be able to continue the activity for more than a scant few years. True adaptations will need to be sustainable in the post-petroleum era.

WATER ADAPTATIONS

Integrated Water Management Plans:

Page 85 Strategy 2b: **Adaptation for climate change AND peak oil adaptation, combined.** Dramatically rethinking our water policies is essential to reducing GHG emissions, adapting to the ramifications of climate change, and to peak oil adaptation. At present, moving and filtering water consumes 19% of California's electricity supply, much of that electricity being derived from GHG-filthy coal.[28]

Page 85 Strategy 2a: Plans which rely on "imported water" and "desalinated seawater" will not be sustainable in a lower carbon, energy-scarce future. Realistic plans must shift toward capturing the rain that falls close to the location of demand. The list is missing locally harvested rainwater, and rainwater infiltration through conversion to permeable surfaces.[29]

Page 85 Strategy 2a: **Reform policies and develop a *working* structure to allocate water in California**. Our current water rights system is antiquated and is based upon a complex web of historical legal claims. It has resulted in such outrageous practices as farmers growing high-water crops in the Sacramento delta area for the bizarre reason of preserving their future rights to water resources, rights which would be lost if they grew a water-efficient crop. As outlined in previous sections of this letter, for a lower-carbon energy-scarce future, food growing must be shifted closer to demand. The current water-war tension between California agriculture and California cities will impede these preparations for our future. Establish standards for *appropriate use*. Rather than deferring to historical "rights," or facilitating the "sustainability" of agribusiness profits, future-oriented water policies must examine the big picture for sustainability of life.

Water Use Efficiency:

Page 85 Strategy 3a: **A 20% reduction in water use may be insufficient,** given the climate change forecasts for shifts in rainfall patterns. The Union of Concerned Scientists' projections are for *30 to 90% loss* in Sierra snowpack.[30] Rainfall is forecast to decrease where our water catchment infrastructure is built.

Page 85 Strategy 3c: **"Energy Efficiency" will be entirely inadequate** to adapt to what is coming. The current concept of recycled water -- achieved via massive, offsite, institutional technologies and long-distance pumping -- is an energy-intensive proposition. True drought-proof water management strategies for an energy-lean future would be more like localized rainwater harvesting and gravity-fed on-site greywater reuse.

Page 85 Strategy 3d and Page 30-31 Strategy 6: **Educational Outreach Campaign in aggressive water-saving techniques** such as water-lean dish washing techniques[31], and navy showers[32], and promote these as a permanent habit change. Develop a funding strategy to support high-impact public awareness campaigns, public service announcements, and advertising. Compile and disseminate industrial best practices as well. We must create culture change.

Page 85 Strategy 3d: **Disseminate information to the public and landscaping professionals in the use of landscaping grading** for rainwater infiltration and water use efficiency. Swales, basins, curb cuts, rainwater infiltration, and mulches should all become common practice.

Page 85 Strategy 3d: **Increase enforcement of drought provisions**. Dramatically increase the fines for offenders. Eliminate waivers for "large landowners" including parks and schools. If landscapes are suffering from the 2008-2009 drought, they contain an inappropriate and unsustainable mix of plants for the warming climate of our future; it's time to change.

Page 85 Strategy 3d: **Exempt local food production from water restrictions**. (see discussion of Page 41 Strategy1c "Food Security") Growing food in urban population centers should be viewed for what it is: a *shift* of water resources from remote agricultural fields to urban centers. Because the edible plants replace ornamental landscaping, and thus eliminate the watering of ornamentals plus decrease the amount of food needed from faraway agricultural fields, growing food within urban centers likely reduces statewide water use overall. Compile and disseminate "best practices" for water-miserly techniques in vegetable gardens.

Page 85 Strategy 3d and Page 30-31 Strategy 6: **Conduct widespread public education programs that distinguish between potable water, greywater, and blackwater** and disseminate simple greywater techniques. Target the general public as well as school educators, plumbing professionals, and employees of state agencies. Make this knowledge commonplace to relieve the "fear factor" which currently exists about reusing water. Publicize the challenge: *How many times can you use water before it leaves your property?* Bring greywater technologies into school lavatories. Research and develop safe best-practices for onsite greywater applications at shared large-scale facilities such as schools, universities, government buildings, and businesses. Integrate gravity-fed greywater systems into the building code, and integrate greywater retrofitting into those building code updates which are required upon remodels.

Page 85 Strategy 3a: Develop a funding strategy for and establish programs which **promote and subsidize installation of onsite greywater systems**. Greywater systems should be onsite (to reduce greenhouse gas emissions and fossil fuel use for long distance pumping and industrial processing requirements). They should be gravity-fed or use manual pumps so as not to create additional power demand. Encourage simple "technologies" such as bucketing, garden sinks[33], and reed-bed filtration.[34]

Research, develop, and disseminate best practices for greywater-to-food-bearing trees and shrubs (see discussion of Page 41 Strategy1c "Food Security"). It can be done. Conduct public programs in greywater best practices, such as distributing the alkaline outflow to several different trees, and changing to biocompatable soaps.

Page 85 Strategy 3a: **Establish policies which end wasteful "mix it first and separate it later" practices.** Our current "mix it first and separate it later" (MIFSLA)[35] policies use imported potable water to flush our toilets, creating massive quantities of sewage which must be pumped and filtered (generating GHG emissions and consuming fossil fuels). Reduce the quantity of wasted potable water, plus reduce the quantity of pumping and filtration required, by reducing at the source: **promote source separating toilets** with subsidies and replacement programs, similar to the way LADWP promoted low-flow toilets. Additionally, any water used in toilets should be greywater.[36] These strategies should be implemented at schools, universities, businesses, and government buildings as well as homes.

Page 85 Strategy 3 Long-Term Actions: **Research composting toilets, and develop best practices.** We must re-learn the skills of safely dealing with human waste on a localized basis, and we must orient our regulations and our public education to be ready for it. In order to preserve the basic physics of our agricultural soils, we must eventually figure out how to safely re-integrate these nutrients back into the growth cycle which produces food.

Water storage:

Page 87 Strategy 6b: Reach beyond "feasibility studies." It's time to **establish policies, priorities, actions, and programs for water storage** based upon the available science and practical experience. Consult with TreePeople in Los Angeles and the extensive practical work they have already done in this area.

Page 87 Strategy 6a: Develop a funding strategy for and establish programs which **promote and subsidize installation of local area cisterns** and home rain barrels (refer to Monterey's large program, or the small LADWP pilot program in the Mar Vista area of Los Angeles). Rainwater harvesting reduces the amount of imported water needed. Plus when citizens save rainwater, they become water-aware; suddenly they begin examining their water use patterns and how they could streamline use.[37]

Page 87 Strategy 6c: Rather than integrating large-scale management plans, **develop a working structure of local-scale enterprises to manage local rainwater cisterns**. As we work to lower our carbon emissions and adjust to lower energy availability, we will have less financial and fuel resources to support massive agencies and regional administration.

AGRICULTURAL ADAPTATIONS

> "Industrial agriculture uses 10 times more energy than it produces. It uses 10 times more water than biodiverse farming with water-prudent crops and organic practices use. In fact, when assessed from nature's economy, biodiverse, ecological farms have much higher productivity than large-scale, industrial, monoculture farms. The illusion of efficiency is produced by externalizing the ecological costs."
>
> – Vanadana Shiva, international food and resource activist [38]

Near Term Actions:

Uphold the highest Organic Standards. Do not allow our current California organic standards to be diluted through the courts or legislative system. At present, our conventional agricultural systems are incredibly dependent upon oil and fossil fuels, for everything from tractors to trucking, to petrochemical pesticides, herbicides, and fertilizers. In an era of declining oil supplies, virtually ALL agriculture will soon have to be local and organic. Current organic standards are not without their flaws, but they are perhaps our most widely disseminated starting place for that post-oil future.

Bio-Energy:

Page 97 Strategy1b: **De-emphasize bio-energy altogether** in policies, priorities, strategies, and actions. When climate change is considered as a stand-alone issue, biofuels might sound like a good idea. However "almost all biofuels used today cause more greenhouse gas emissions than conventional fuels if the full emissions costs of producing these 'green' fuels are taken into account."[39]

Biofuels require massive inputs of fossil-based fuels for agricultural sprays, harvesting, and refining. The Energy Returned on Energy Invested (EROEI) for biofuels varies from a negative (more fossil inputs required than biofuel energy reaped) to a very low (i.e. inefficient) figure.[40]

As outlined at our page 2 above, the amount of land required to grow sufficient biofuels to put a significant dent in replacing fossil fuels is so enormous that it is ridiculous to plan for any substantial amount of biofuel technology.[41]

Biofuels are typically combined with a very high percentage of fossil fuels (example: E85 = 85% fossil) before they are burned in internal combustion engines.

As we journey further into the final years of the Oil Era, we will not have the fossil fuels to keep the biofuels dream alive. Biofuels are only short-term scenarios which cannot be perpetuated into a post-petroleum future.

Agrobiodiversity:

Page 98 Strategy 1d: Establish policies which will **eliminate Genetically Modified Organisms**. Refer to the best available science from international and European sources (locations where American agribusiness cannot influence the "research"). GMO crops were developed in order to tolerate petrochemical spraying. As a result, these plant varieties cannot grow and thrive without petrochemical herbicides, pesticides, and fertilizers. Additionally, they are laboratory-dependent. Localized seed saving of these crops is impossible and prohibited. Thus GMOs prevent the development of local-climate-evolved subvarieties, and in so doing they undermine our agricultural resilience and the security of our food supply. We cannot permit further spread of GMOs because GMOs will not survive (and will not be able to feed us) in an oil-scarce, climate change, economically constrained future.

Page 98 Strategy 1d: Establish policies and priorities which **promote climate-resilient crop varieties**. "Identification" has already been done by heirloom seed savers such as Native Seed SEARCH in Arizona and the national nonprofit Seed Savers Exchange. "Research and development" has been done by generations of local food growers, from Native Americans into recent times. We don't need agribusiness-financed Research and Development – in fact this is quite desirable to avoid; keep corporate patents and corporate profiteering out of our food supply. **Promote sustainable methods of feeding our population** rather than oil-dependent practices.

Page 98 Strategy 1e: **Crop diversification is quite necessary**, but the reasons given at 1e are inappropriate. Regarding energy crops, see "Bio-energy" discussion above. Recycled water was similarly debunked at "Water Adaptations" above.

Crop diversification, rather than today's monocropping practices, is imperative for the building of healthy, fertile, productive organic soils. We need to intentionally grow *carbon crops* to manufacture soil-building compost and grow *legumes* to till back into depleted soils.[42] We need to grow diverse types of crops such as *medicinal herbs, fiber crops, beneficial insect habitat plants,* and *a full panorama of edibles*. And we need create policies and programs to **grow these diverse crops much**

closer to where people are, in order to reduce greenhouse gas emissions and oil consumption from long-distance transportation.

True, this description of crop diversification renders farming with today's industrial-style methods impossible. But as the quote at the beginning of the Agricultural Adaptations section of this letter reveals, today's industrial-style methods are flawed in many ways. And as we face an energy-constrained future, today's industrial-style methods are clearly outdated.

Page 98 Strategy 1f: The concept of **Cultural/Economic Diversification** changes dramatically when peak oil is considered in conjunction with climate change. Activities like ecotourism will become quite impractical; it is unwise to promote these oil-intensive activities as potential "solutions" in a time of declining supply. Cultural and Economic Diversification in a peak oil/climate change world is more likely to center around the aforementioned urban food production and include local arts and entertainment, local "slow foods,"[43] and multiple hands-on craftsmanship professions.[44]

Page 98 Strategy 1f, Page 42 Strategy 2, and Page 45 Strategy 6: As state agencies promote "green jobs" and "green economies," these should include the economic projections, resource projections, and the fallacy of "growth" described earlier in this letter; educate the public that truly green jobs will facilitate local community resilience within a lower-carbon, powered-down future.[45]

Farm and Land Management:

Page 98 Strategy 2a: **Streamlining** under Strategy 2a must not be permitted to compromise organic standards for the reasons discussed above. Recognize that the dairy digesters are only a short-term mitigation technology; large scale factory-style farming is not sustainable without massive fossil inputs, therefore cannot continue into our post-petroleum future.

Page 98 Strategy 2d: **Compile and disseminate best practices for resilient agriculture.** These include use of local subvarieties which are more resilient to variability in climate, and variability in water supply. These include polycropping, use of microclimes, and use of grading (swales, waffle stamps, etc) developed for low-water scenarios. These include phasing out all petroleum-derived inputs, and cultivating rich soil life.

Page 98 Strategy 2e: **High-Carbon Crops** - see comments under "Crop Diversification", above.

Page 98 Strategy 2: **Urban Farming.** Establish policies, priorities, and actions which encourage the cultivation of food crops within urban centers *where the population is*, to reduce the GHG outputs of transporting food, and to increase food security as fuels become scarce. (see discussion of Page 41 Strategy1c "Food Security")

Page 98 Strategy 2 and Page 45 Strategy 8: Support policies, priorities, and actions which promote agrobiodiversity and economic diversification: **End farm subsidies**, particularly subsidies to large agribusinesses. Ten percent of the recipients of California subsidies collected 73 percent of the funding.[46] Support development of policies to end farm subsidies at the federal level as well.[47] Ending these payments would "level the playing field for small farmers everywhere," according to Jim Lyons of Oxfam America.[48] Large agribusinesses will be unable to continue their massive operations without oil. Small, diversified, local farms have much more resilience to feed our citizens into a lower-carbon, post-petroleum future.

FORESTRY ADAPTATIONS

Page 116 Strategy 3g iii and Page 26-27 Strategy 3: As fire protection services are evaluated for climate change preparedness, state agencies must also research new practices and identify strategies and resources that would **re-outfit fire and first responders** for operations within a context of

extremely expensive or limited oil supplies. How do we run a fire truck without oil? As we create changes for climate adaptation, we must include peak oil considerations and retool for the full reality of our future.

Page 116 Strategy 3g ii and Page 24-26 Strategy 2: Put wildfire considerations in land use. Page 41 Strategy 1b addresses land use; the forestry section at Page 116 Strategy 3g ii should address land use too. We should **avoid planning, permitting, developing, and building new developments in areas that cannot be adequately protected from wildfire due to climate change**.[49]

Page 115 Strategy 3a iii: **Urban forestry should introduce food-bearing trees**. Local urban forestry departments maintain tree lists of recommended species. These lists should be revised to include locally appropriate fruit and nut trees. (see discussion of Page 41 Strategy1c "Food Security")

TRANSPORTATION AND ENERGY ADAPTATIONS

Energy Efficiency Efforts:

"Energy Efficiency" will be entirely inadequate for the future we face. When peak oil is considered in tandem with climate change, the realistic solutions open to us become quite well-defined. **We must power down**, in other words decrease our energy consumption overall, in order to bring demand within the capacity of what renewable energy can truly achieve.

In the same way that this Adaptation Strategy differentiates between "mitigation" and "adaptation," we must be clear about the difference between "conservation/efficiency" and "power down." As we presented at the beginning of this letter, our future demands that we adjust to substantially lower energy-producing capacity. **Change the policy of Page 127 Strategy 1 from "efficiency" to "power down."**

Page 127 Strategy 1 emphasizes "climate vulnerable areas" but when energy projections are considered, virtually **all areas of our society are "vulnerable areas."**

Develop an **Educational Outreach Campaign** (akin to Page 42 Strategy 2a) to encourage people to permanently decrease and eliminate energy use. These must go far beyond "flex your power" and "conservation" in their approach. We must achieve a permanent decrease in the demand for power. To accomplish this, we must achieve a permanent decrease in the expectation for power.

Businesses and industries should be included as part of all educational outreach. The Industrial and Commercial sectors currently produce 23% of California's GHG emissions. Policy-shifting is needed. State agencies should **phase out subsidies, grants, and support to fossil-intensive industries.** Shift these freed-up public resources toward industries and infrastructure which builds local resilience and community self-sufficiency, grows sustainable local-scale jobs and economies, and prepares California for our lower-carbon post-petroleum future.[50]

We applaud Page 127 Strategy 1b in calling for **local, decentralized renewable power sources located near demand.** Community-based energy sources grow resilient communities (ref: Page 41 Strategy 1), grow local economies, save power lost in transmission line losses, and add energy security in the likelihood of grid failures.

New energy facilities:

Page 128 Strategy 2a: As we assess vulnerability to climate impacts, we must **simultaneously assess vulnerability to peak oil impacts.**

Page 128 Strategy 2a: The use of the word "reasonable" in conjunction with adaptation is worrisome. It is imperative that **all energy facilities must meet the requirements of California Global Warming Solutions Act of 2006** (Division 25.5, commencing with Section 38500, of the Health and Safety Code). If they do not, these energy facilities are unfavorable for both mitigation and adaptation (ref: Adaptation Strategy Figure 4 page 14).

With the mention of "least sensitive environmental areas" and "maintaining natural habitats," Page 128 Strategy 2b appears to have been written with large-scale, remotely-sited energy fields in mind. This appears to be in conflict with the more appropriate Page 127 Strategy 1b which would **bring energy sourcing close to the location of demand.**

Page 128 Strategy 2b: As we "encourage expansion of renewables" it is critical to **define which renewables are to be expanded**. As discussed in previous sections of this letter, truly renewable energy must be independent of fossil inputs. Thus natural gas and coal are not renewable. Most biofuels don't qualify as renewable. Nuclear doesn't qualify as renewable because its fuel is not renewable (and is experiencing "peak"), and it requires tremendous amounts of fossil fuels to maintain safety and security.

Page 128 Strategy 2c should **also integrate ASPO and other international estimates of remaining fossil fuel resources**.

Page 128 Strategy 2d, Page 42 Strategy 2c and Page 24-26 Strategy 2: **Avoid planning, permitting, developing, and building new developments in areas that cannot be adequately protected from extreme heat due to climate change**.[51] In 2005 space conditioning accounted for 36% of CO2 emissions for commercial buildings and 46% of emissions for residential buildings.[52] Peak oil plus the limitations of renewable energy dictate that extensive heating, ventilation and air conditioning will not be available, perhaps by the end of the next decade. Thus the issue of "hot spots" and "heat islands" becomes critical and the list of "vulnerable populations" expands considerably.

Hydropower:

Page 128 Strategy 3: As we understand it, the greatest "vulnerability" of hydropower as a long-term energy source is that climate change forecasts show rainfall patterns shifting.[53] Many of our existing hydropower facilities are likely built in locations where there will be severely reduced snowpack/rainfall in coming decades, thus jeopardizing the energy supply we have come to count on from these facilities. This is not spelled out in the Adaptation Strategy and should be.

Given that water supply in the future might not be located where the hydropower facilities have been built, Page 128 Strategy 3c seems contrary to public interest. Forming public-private partnerships sounds like an effort to reduce risks to the profits of the hydropower facility owners, at taxpayer expense. If indeed snowpack/rainfall will no longer adequately serve these facilities, this is a permanent physical situation, which no amount of "partnership" will help. Instead of boosting dying enterprises with public funds, we should accept the inevitable abandonment of these facilities and **invest those public funds in facilities which will truly grow societal resilience** such as community-based renewable power sources located near demand.

Renewable Energy Goals:

Page 129 Strategy 4: The **assessment should consider peak oil forecasts** and whether we'll have the oil to fuel the manufacture and construction of facilities.[54] The assessment should also consider

whether, "cradle to cradle," we have sufficient pure silicon as well as other trace elements, in sufficiently abundant quantities to assure affordability, and close enough to construction sites to reduce transportation, to manufacture the quantity of goods needed for the projected number of photovoltaics, computers, turbines, etc.

Page 129 Strategy 4: The assessment should **calculate and publicize the amount of shortfall** between the current level of energy demand and the capacity of renewable energy to meet that demand.[55] This shortfall should be considered in conjunction with ASPO projections of decreasing fossil fuel availability. As we understand it, the shortfall will be considerable. Renewable energy capacity cannot hope to match the opulent amount of energy to which we have become accustomed during this brief era of fossil fuels. We have no choice but to decrease our energy demands, to "power down."

Transportation:

Transportation represents 39% of California's greenhouse gas emissions,[56] thus it is astounding that transportation is given such a cursory examination in this Adaptation Strategy. While the Health section of the Adaptation Strategy addresses *practical details* such as expanding trainings and creating public programs, and *policy issues* such as the promotion of sustainable practices, the Transportation section is predominantly about "assessment"; it is virtually silent as to *actual mitigation and adaptation strategies.* We must achieve major policy shifts and major practical, physical revisions in Transportation within the next few years.

The Transportation section of the California Climate Adaptation Strategy is lacking some major aspects of the Transportation sector:

- Adaptation means *we must change our policies and our paradigms to a local view*. In the coming decades we will be forced by energy realities to source goods more locally, grow food locally, obtain water resources locally, do business and vacation locally.
- The Transportation sector should appropriately *expect to shrink* as the next two decades unfold. With the end of the brief Age of Cheap Oil comes the end of the brief age of globalization (trucking) and the brief age of extreme mobility (passenger automobiles). State agencies must acknowledge that there is no "hydrogen economy" forthcoming on any significant scale; since we haven't solved technological nor infrastructure problems when we've had considerable economic resources and copious supplies of oil to work with, it is very unlikely we will be able to do so amidst a shrinking economy with decreasing resources. Similarly we are unlikely to replace the state's 33 million vehicles with electric vehicles when facing the timetable and the shortfalls discussed in the early pages of this letter. Each new vehicle requires 20 barrels of oil to manufacture and in a world of extremely volatile oil prices and decreasing oil supply, manufacture of massive numbers of new-technology vehicles simply is not going to happen.
- Air traffic is never mentioned. With regards to climate change mitigation, air traffic should be severely curtailed. Air transportation creates 12% of U.S. greenhouse gasses, and these high altitude emissions have a more potent global warming impact than if released at ground level.57 Air flight, particularly any "short hop" flight under 500 miles, tops the list of the most GHG polluting, least fuel-efficient forms of travel.[58] With regards to adaptation, state agencies must acknowledge that the air traffic industry is a dying industry. "No air carrier has a viable plan to make a profit with oil at current prices—much less in years to come as the petroleum available to world markets dwindles rapidly."[59] **The California Climate Adaptation Strategy should list strategies for air traffic** (suggestions listed below).

- Shipping is never mentioned. According to the International Maritime Organization, ships emit 4% of global CO2 emissions.[60] The California Climate Adaptation Strategy should list strategies for the shipping industry (suggestions listed below).
- Climate change mitigation indicates that we should **revive our rail systems**. "Shifting 10% of long-haul freight from the highway to the railway would reduce annual greenhouse gas emissions by more than 12 million tons."[61] Peak oil adaptation will demand rail. "Trains can move a ton of freight 423 miles on a single gallon of fuel."[62] In a lower-carbon, energy-scarce future, rail remains the best option for mid- to long-distance transport.

Transportation vulnerability assessment and adaptation:

Page 129 Strategy 5: Under peak oil, every aspect of the contemporary concept of "transportation" is vulnerable.

Page 129 Strategy 5a and Page 29-30 Strategy 5: **Vulnerability and adaptation planning must consider energy resources** and include peak oil impacts. Peak oil means that our future offers less fossil fuels, less natural gas, and no viable long-term liquid fuel replacements. In short, our future will be one of far less mobility. We will see decreases in imports, decreases in trucking, and decreases in personal transportation.

It is imperative that **all needs assessments for transportation consider peak oil and climate change forecasts**, including all project proposals and all environmental impact reports. With extreme fuel price volatility and oil shortages there will be fewer trucks and automobiles on the road; there will be far less need for gigantic highways, and no need for highway expansion beyond what we have today.

An **Educational Outreach Campaign** (akin to Page 42 Strategy 2a) should be created to encourage citizens and industries to permanently decrease and eliminate transportation use.

Page 129 Strategy 5 and Page 26-27 Strategy 3: As stated above under Page 128 Strategy 2d and Page 42 Strategy 2c, climate change temperature rise combined with energy supply irregularities under peak oil (and thus lack of heating, ventilation, and air conditioning) are likely to render some geographic areas virtually uninhabitable. Vulnerability and adaptation planning must anticipate climate-change-driven population migrations which will result in land use and property ownership conflicts. The California Climate Adaptation Strategy is silent with respect to the police, prison, and security sector. With forecasts of increased economic hardship and challenges to food, water, and fuel supplies, civil uprisings are possible. **Assess the impacts of climate change plus peak oil on police and security**. Police and security must plan for operations despite extremely expensive, limited or interrupted oil supplies, amidst economically constrained times.

Page 129 Strategy 5: The California Climate Adaptation Strategy is lacking strategies for solid waste management. **Assess the impacts of climate change plus peak oil on solid waste management infrastructure.** Climate change mitigation dictates that all landfills be capped for methane capture; these can become short-term sources of electricity. The landfill-capacity-driven "zero waste" campaign takes on new urgency when peak oil forecasts predict extremely expensive or limited oil supplies amid economic constraints for waste hauling. Strategies should include localized composting facilities, severe waste-reduction policies, and mandating the elimination of "disposable" single-use goods.

Existing Transportation and investment decisions:

Page 129 Strategy 6: Budgetary and economic constraints are affecting current transportation and investment decisions. It is important to recognize that economic resources will continue to contract

as we experience the long-term repercussions of peak oil and resource limitations. Thus it is critical that **every transportation project and investment decision prepare our society for our lower-carbon, post-petroleum future**. At this point in time any further highway expansions are a waste of precious public funds.

Page 129 Strategy 6: In transportation and investment decisions we must consider the present time to be one of "peak materials." After fossil fuel combustion, iron and steel production and cement manufacture are the #2 and #3 sources of CO2 emissions.[63] Because of peak oil, cheap asphalt derived from cheap oil will not be available for much longer. Climate change mitigation and adaptation strategies should direct CALTRANS to carefully consider any changes to transportation infrastructure. **Establish policies, priorities, and strategies such that all construction from this point forward prepares us for our lower-carbon, post-petroleum future**. Construction that supports the existing fossil-based transport system is a waste of resources, emissions, and taxpayer funds.

Page 129 Strategy 6: **Phase out projects which support fossil-based modes of transport** (freeways, highways, and roads). Shift the freed-up resources and funding toward infrastructure for lower-carbon post-petroleum transport instead.

Page 129 Strategy 6: Support policies which strengthen the **California Global Warming Solutions Act of 2006** (Division 25.5, commencing with Section 38500, of the Health and Safety Code), as discussed earlier in this letter.

Page 129 Strategy 6: **The California Climate Adaptation Strategy should list Strategies for air transport** such as:

- Mitigation: Establish policies and develop guidelines based upon the best available science (including European studies and policies[64]) to make the remaining years of aviation operations as environmentally-responsible as possible;
- Initiate the development of a working structure which would give California climate-change jurisdiction and enforcement ability;
- Phase out use of aviation by state agencies;
- Phase out any subsidies of aviation operations. Consider state-level carbon emissions taxes. Allow the true cost structure (including environmental costs) to influence the free market.
- Adaptation: Establish construction policies and priorities *based upon overall climate science and peak oil projections*; these forecast the demise of the aviation industry. Curtail any further investment of precious public funds in airport expansions, runway expansions, airport renovations, and "upgrades" for this dead-end industry.

Page 129 Strategy 6: **The California Climate Adaptation Strategy should list Strategies for the shipping industry** such as:

- Mitigation: Establish policies and develop standards for increased fuel efficiency and decreased speed.[65]
- Initiate the development of a working structure which would give California climate-change jurisdiction and enforcement ability;
- Increase policing and enforcement of existing environmental guidelines.
- Adaptation: Develop policies which encourage industry research into wind technologies as some German companies are doing.[66]
- Develop policies which shift the public to decreasing the amount of goods we import, overall.

Rehabilitating the transportation system:

Coordinate efforts, even within this Adaptation Strategy. Page 41 Strategy 1b mentions bicycling, but bicycling doesn't appear in the Transportation section at pages 129-131.

Page 130 Strategy 8 and Page 41 Strategy 1b: Establish policies, priorities, and strategies that **promote human-powered transportation as the *primary* mode** of transportation. As we lower our carbon emissions amid decreased fuel availability, walking and bicycling are the transportation for our future.

Page 130 Strategy 8 and Page 41 Strategy 1b, Land use and city planning: Promote increased access to **safe bike paths and pedestrian walkways.** Require them in any renovations of streetscapes or neighborhoods. Consult with local bicycle advocacy groups to understand local hazard spots (improper models of grates, uneven surfaces, narrow shoulders on high-speed highways, etc.), develop a funding strategy, and make these repairs and remodels high priority.

Page 130 Strategy 8: **Promote depaving** to allow for rainwater infiltration, and free up land for urban farming and tree planting. Establish policies which will actually *decrease* lanes on boulevards and highways. Allow the short-term traffic backlog to incentivize bicycling as we pour precious repair funds into preparation for the reality of our future.

Page 130 Strategy 8: **The Adaptation Strategy should include strategies for rail** such as:

- Develop a comprehensive funding strategy and establish priorities and actions toward rehabilitation and expansion of track.
- Advise and revise standards, and resolve disputes over rail rights. These are apparently rather unique to California and cripple Amtrak efficiency in our state.
- Initiate a mapping effort, with statewide prioritization of areas, to rejuvenate rail-based freight transport infrastructure.
- Promote increased access to passenger rail such as Amtrak and local urban systems such as BART and Los Angeles Metro.

Page 130 Strategy 8: Develop a comprehensive funding strategy to research and begin developing fossil-free mass transit.

<u>COMPREHENSIVE STRATEGIES</u>

Each of the Comprehensive Strategies (1 through 6, Pages 23-31) was written solely to address climate change. But as we have outlined in this letter, addressing climate change as a stand-alone problem will not be effective. The simultaneous occurrence of peak oil radically changes which climate change mitigations and adaptations will be feasible. Each of the Comprehensive Strategies must include peak oil and climate change *combined* in their actions in order to have any hope of being viable.

Peak oil combined with climate change highlights the unsustainability of our current North American lifestyles. We simply cannot keep going like this. The choices our society makes and the policies we set in place over the next decade will determine human survival. We must radically alter the ways we currently tell ourselves are "normal."

This comprehensive California Climate Adaptation Strategy represents significant potential to reorient statewide policies toward a wiser, more healthy, more sustainable direction. We hope that in the final version, the Adaptation Strategy will acknowledge that

- Any realistic intermediate-term mitigation or adaptation strategy must consume less oil and less fossil resources overall.
- Any long-term mitigation or adaptation strategy must be designed to operate petroleum-free in the severely constrained energy supplies of the future.
- Any short-term mitigation or adaptation strategy must constitute a wise use of our remaining oil supplies, and must better prepare us for life beyond the oil age.

Sincerely,

Joanne Poyourow
Transition Los Angeles

The Reverend Peter H. Rood, Jr.
Environmental Change-Makers

Transition Los Angeles is a group of local grassroots citizens who are preparing our communities for a positive outcome through the sweeping changes coming with global warming and peak oil. They work to Transition our society from our current high-energy, high-consumption lifestyles toward our inevitable lower-powered future. They do this by growing local *resilience*, our ability to flex and adapt to change. Their predecessor organization -- the **Environmental Change-Makers** of Westchester -- has held free public meetings on environmental solutions for over three years. Transition Los Angeles is affiliated with Transition United States and the international Transition Network.

Cc: Mayor Antonio Villaraigosa
Councilmember Bill Rosendahl
Assemblymember Curren Price
Assemblymember Ted Lieu
Representative Maxine Waters
Congresswoman Jane Harman
Governor Arnold Schwarzenegger
Congressional Peak Oil Caucus c/o Representative Roscoe Bartlett

Notes

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[31] The Girl Scout method is described here http://hubpages.com/hub/Water-Saving-Dishwashing
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[35] http://www.holon.se/folke/kurs/Distans/Ekofys/Recirk/Eng/mifsla_en.shtml
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[53] "Decreasing California Snowpack" diagram, page 7, Union of Concerned Scientists, "Our Changing Climate" http://www.climatechoices.org/ca/index.html
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http://knowledge.allianz.com/en/globalissues/0/climate_solutions/aviation_emissions_reduction.html

[65] "Modern engines and propellers, and streamlined hull designs have improved fuel efficiency by up to 30 percent. The most advanced vessels, such as the world's largest ship the Emma Maersk, recycle their exhaust back into the engine. But the need for timely delivery has led many shipping companies to use these advances to increase speed and capacity rather than reducing carbon emissions. According to the OECD, increasing a ship's speed by about 4 percent entails a 13 percent increase in CO2 emissions."
http://knowledge.allianz.com/en/globalissues/energy_co2/transportation/transportation_climate_cars_ships_aviation_rail.html

[66]http://knowledge.allianz.com/en/globalissues/energy_co2/transportation/transportation_climate_cars_ships_aviation_rail.html