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DOES CARBON TAX MAKES SENSE? ASSESSING GLOBAL SCENARIO AND ADDRESSING INDIAN PERSPECTIVE

Mohana Mondal
Zareena Begum Irfan
Sunder Ramaswamy

MADRAS SCHOOL OF ECONOMICS
Gandhi Mandapam Road
Chennai 600 025
India

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Mohana Mondal
Research Associate, Madras School of Economics
eemohana@mse.ac.in

Zareena Begum Irfan
Associate Professor, Madras School of Economics
zareena@mse.ac.in

and

Sunder Ramaswamy
Director and Professor, Madras School of Economics
sunder@mse.ac.in

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MADRAS SCHOOL OF ECONOMICS
Gandhi Mandapam Road
Chennai 600 025
India

Phone: 2230 0304/2230 0307/2235 2157
Fax : 2235 4847/2235 2155
Email : info@mse.ac.in
Website: www.mse.ac.in

Does Carbon Tax Makes Sense? Assessing Global Scenario and Addressing Indian Perspective

Mohana Mondal, Zareena Begum Irfan and Sunder Ramaswamy

Abstract

Carbon taxes have been frequently advocated as a cost-effective instrument for reducing emissions. However, in the practice of environmental policies, only few countries have implemented taxes based on the carbon content of the energy products. Current circumstances of climate science may permit a reconsideration of direction for existing policy efforts related to global warming issues. This paper presents a plan that provides an achievable path toward a global policy on Green House Gas (GHG) emissions. At the heart of it is a small carbon tax (actually a GHG tax). The proceeds of that tax are to be used strategically to provide stable, long term support of a broad based research and development effort focused on energy sources, energy use, and emission mitigation. Hence, the aim of framing a concept note is to compare the carbon taxation system across nations. The scenario prevailing in different countries is examined and addressed for the Indian structure. Carbon taxes with regard to their competitiveness, distributional and environmental impacts. The evidence shows that carbon taxes may be an interesting policy option and that their main negative impacts may be compensated through the design of the tax and the use of the generated fiscal revenues.

Keywords: *Pollution, Pollution Control, Carbon tax, India, Environmental Impact, GHG tax, Air Pollution, Ecotax, Environmental Regulation*

JEL Codes: *O330, O380, Q520, Q530, Q560, Q580*

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Mohana Mondal,
Zareena Begum Irfan
Sunder Ramaswamy

INTRODUCTION

Global warming refers to the observed century-scale rise in the average temperature of the Earth's climate system and its related effects. In recent years, the effects of global warming have drawn more and more global attention (IPCC, 2014). Most of global warming was being caused by increasing concentrations of greenhouse gases. To deal with the impacts of greenhouse gases emissions, especially carbon dioxide, some countries have introduced an efficient economic measure—a carbon tax—in order to save energy and reduce carbon dioxide emissions (Lin and Li, 2011). A carbon tax is usually defined as a tax based on greenhouse gas emissions (GHG) generated from burning fuels. It puts a price on each tonne of GHG emitted, sending a price signal that will, over time, elicit a powerful market response across the entire economy, resulting in reduced emissions. It is a form of carbon pricing. Carbon is present in every hydrocarbon fuel (coal, petroleum, and natural gas) and is released as carbon dioxide (CO_2) when they are burnt. In contrast, non-combustion energy sources—wind, sunlight, hydropower, and nuclear—do not convert hydrocarbons to CO_2. CO_2 is a heat-trapping "greenhouse" gas which represents a negative externality on the climate system. Since GHG emissions caused by the combustion of fossil fuels are closely related to the carbon content of the respective fuels, a tax on these emissions can be levied by taxing the carbon content of fossil fuels at any point in the product cycle of the fuel. Carbon taxes offer a potentially cost-effective means of reducing greenhouse gas emissions.

A number of countries have implemented carbon taxes or energy taxes that are related to carbon content. The Netherlands, Denmark, and Sweden have been collecting carbon taxes for more than 10 years. China has also listed such a scheme into its national development program, and would begin to collect the carbon tax as early as the 13^{th} five-year plan period (2016–2020) (Liu *et. al.*, 2014). Fossil fuel burning is response of the major amount of the increase in CO2 emissions. The amount of

global CO2 emissions in 2011 from fossil fuel combustion was 34.8 billion tonnes. Coal burning was responsible for 43 percent of the total emissions (Le *et. al.,* 2013). Carbon taxes can be introduced as an independent instrument or they can exist alongside other carbon pricing instrument, such as an energy tax. While the experience with direct carbon tax implementation is relatively new, such instruments are being introduced at a fast pace.

Current circumstances of climate science may permit a reconsideration of direction for existing policy efforts related to global warming issues. This paper presents a plan that provides an achievable path toward a global policy on Green House Gas (GHG) emissions. At the heart of it is a small carbon tax (actually a GHG tax). The proceeds of that tax are to be used strategically to provide stable, long term support of a broad based research and development effort focused on energy sources, energy use, and emission mitigation. Hence, the aim of framing a concept note is to compare the carbon taxation system across nations. The scenario prevailing in different countries is examined and addressed for the Indian structure.

ASSESSING CARBON TAXATION ACROSS NATIONS

The literature broadly supports the view that any monetary value such as carbon tax works as an incentive for people towards the use of sustainable transport. Michaelis and Davidson (1996) find that fuel taxes and other government policies, including fee bates can help to reduce transport energy intensity and traffic levels. Fee bates is an instrument of revenue recycling where a combination of "carrot and stick" i.e. charges and compensation together are used in order to get a net economic benefit (double dividend). Double Dividend depends on the balance between economic losses caused by the ecological taxes and the benefits accruing from the revenue recycling sometime in the form of subsidy (Ben-Elia and Ettema, 2009). It works as an incentive to effectively

reduce CO2 emissions and eliminate polluting vehicles. It is designed for revenue neutralization and helps to balance the regressive and distributional effects of a carbon tax. It will lead to fairness in CO2 emission reduction (Hammar and Jagers, 2007; Proost and Van Dender, 2012). Schipper *et. al.* (1997) emphasise on technological innovation and behavioural adoption to reduce carbon content from energy. Stanley *et. al.* (2011) also suggest some behavioural and technical changes which can directly reduce the CO2 emission such as travel behaviour change, fuel substitution, reduce urban car travel kilometre and improve fuel efficiency. But behavioural adoption needs a strong motivation. Awareness and any monetary charge can motivate them. Therefore, it is important to know how much people are willing to pay if any compensation imposed on them.

The last three decades have been warmer than all preceding decades since 1850; the rate of sea level rise has exceeded the mean rate during the previous two millennia, and glaciers and ice sheets have continued to shrink (IPCC, 2013). These changes are in part caused by the large increase of anthropogenic concentration of greenhouse gases in the atmosphere, in particular the increase in the atmospheric concentration of CO2 since 1750 (IPCC, 2013). Climate change is contributing to the increase in intensity and/or frequency of weather extremes with economic and social costs that continue to set new records. For example, Hurricane Ivan killed 28 people on the Caribbean island of Grenada in 2004 and caused overall damages estimated to be twice the GDP of Grenada, while Hurricane Sandy in 2012 is estimated to have resulted in damages of around USD 75 billion in the US (or around 0.5 percent of GDP). Similarly, the 2003 heat wave in Europe contributed to an estimated 50 000 excess deaths (IPCC, 2007), while drought conditions associated with the Russian heat wave in 2010 caused grain harvest losses of around 25 percent (valued at around USD 15 billion) (World Bank, 2012). Recognising the potentially catastrophic impacts of climate change, the global community has agreed to limit the average

global temperature increase to no more than 2ºC above pre-industrial levels (UNFCCC, 2011). A stabilisation of the concentration of greenhouse gases in the atmosphere at 450 parts per million (ppm), in CO2 equivalent, would be consistent with this long-term global goal (IPCC, 2007). Although there are a number of possible trajectories for reaching the 2ºC target, they all imply a reduction to zero of the net global greenhouse gas emissions in the second half of this century (OECD, 2012a). Despite a widespread understanding of what needs to happen, the current level of climate policy action is not consistent with a 450 ppm stabilisation pathway. Global emissions of CO2 from the energy sector have grown by more than 1.5 percent per year since 1990, increasing from around 20 gigatonne of carbon dioxide equivalent (GtCO2e) in 1990 to almost 32 GtCO2e by 2012 (IPCC, 2007; IEA, 2013). Many countries have adopted policies that directly or indirectly encourage lower greenhouse gas emissions. But other trends and policies are in place that leads to higher emissions. The 2ºC goal requires a stronger mobilisation of the international community together with the implementation of more coherent and cost effective policies at the national and sub-national level to reduce greenhouse gas emissions. Governments are unlikely to succeed in this effort unless they manage to keep the cost of climate action to society to a minimum, particularly as many countries are still recovering from the worst economic crisis in decades. Market-based instruments, such as emissions trading systems and carbon taxes, play an important role in promoting investments in zero carbon solutions. But such policy instruments must be part of a consistent and coherent government approach to carbon pricing that also takes into account the impact and cost-effectiveness of other policy instruments that discourage the emission of greenhouse gases as well as those policies which may inadvertently encourage emissions.

Many industrialized countries have used carbon taxes to discourage fossil fuel emissions and promote clean energy. For example, Sweden has used a carbon tax to reduce greenhouse gas emissions since

1991. Although a suite of other policies has also been used, the Swedish Ministry of Environment estimated the carbon tax has cut emissions by an additional 20 per cent (as opposed to solely relying on regulations), enabling the country to achieve its 2012 target under the Kyoto Protocol. Sweden's carbon tax has been credited with spurring the innovation and use of green heating technologies that have significantly phased out burning oil for heating.

Although some critics claim a carbon tax would damage the economy, Sweden's carbon tax is a hefty $140 per tonne of carbon pollution. Since the carbon tax was introduced, Sweden's economy has grown by more than 100 per cent, and the country recently ranked fourth in the world on economic competitiveness.

In Canada, B.C. and Quebec use carbon taxes as part of their strategies to reduce emissions and encourage investments in energy-efficiency and renewable energy.

In British Columbia the carbon tax (introduced in 2008) applies to the purchase or use of fuels within the province. The carbon tax is revenue neutral; all funds generated by the tax are returned to citizens through reductions in other taxes.

Chile’s carbon tax is part of legislation enacted in 2014. The country is to start with measuring of carbon dioxide emissions from thermal power plants in 2017 and begins the tax on CO2 emissions from the power sector in 2018 at USD5 per tCO2e.

In 1997, Costa Rica enacted a tax on carbon pollution, set at 3.5 percent of the market value of fossil fuels. The revenue generated by the tax goes toward the Payment for Environmental Services (PSA) program, which offers incentives to property owners to practice sustainable development and forest conservation.

The Danish carbon tax covers all consumption of fossil fuels (natural gas, oil, and coal), with partial exemption and refund provisions for sectors covered by the EU ETS, energy-intensive processes, and exported goods, fuels in refineries and many transport-related activities. Fuels used for electricity production are also not taxed by the carbon tax, but instead a tax on electricity production applies.

Originally, though Finland was based on carbon content only, Finland's carbon tax was subsequently changed to a combination carbon/energy tax. It initially covered only heat and electricity production but was later expanded to cover transportation and heating fuels.

In December 2013 the French parliament approved a domestic consumption tax on energy products based on the content of CO2 on fossil fuel consumption not covered by the EU ETS. A carbon tax was introduced from April 1, 2014 on the use of gas, heavy fuel oil, and coal, increasing to €14.5/tCO2 in 2015 and €22/tCO2 in 2016. From 2015 onwards the carbon tax has been extended to transport fuels and heating oil.

In Iceland, all importers and importers of liquid fossil fuels (gas and diesel oils, petrol, aircraft and jet fuels and fuel oils) are liable for the carbon tax regardless of whether it is for retail or personal use. A carbon tax for liquid fossil fuels is paid to the treasury, with (since 2011) the rates reflecting a carbon price equivalent to 75 percent of the current price in the EU ETS scheme. The EU ETS is the largest greenhouse gas emission trading scheme and is central to the EU's approach to meet the region's emission target specified in the Kyoto Protocol. It is compulsory for the EU's 28 member countries, in addition to Iceland, Lichtenstein and Norway that joined voluntarily the EU ETS in 2008. The EU ETS was launched in 2005 and is now in its third phase. Phase I (2005-2007) was a test phase that allowed for experiences to be developed, and banking was not allowed into Phase II. In Phase II (2008-2012), each EU member

state had its own national emissions target defined by the EU burden-sharing agreement, which, together with the emission inventories from the first phase, guided allocation to the entities covered by the EU ETS. In Phase III (2013-2020), a single EU-wide emissions target was introduced for the trading system. Emission allowances are annually decreased by 1.74 percent to achieve a 21 percent reduction of greenhouse gas emission in 2020 compared to 2005 emissions. The EU ETS covers around 45 percent of EU's total greenhouse gas emissions, focusing on three types of gases i) CO2 from power plants, energy-intensive sectors and commercial airlines; ii) nitrous oxide (N2O) from the production of certain acids; and iii) perfluorocarbons (PFCs) from aluminium production. The aviation sector is covered by the EU ETS but its active participation has been deferred to allow for an international agreement on aviation emissions. Participation in the EU ETS is mandatory for the emission of gases falling into one of the three categories, subject to minimum size thresholds. Sectors already covered by other domestic policies that reduce emissions by an equivalent amount can in theory be exempted from the EU ETS, although this option has not been used in practice. In Phase I, individual emission caps for each of the member states were outlined in the countries' National Allocation Plans that together resulted in the EU-wide cap. Although the European Commission reduced the caps in 15 member states by an estimated 290 million tonnes of CO2, with the objective of enforcing scarcity, allocated allowances exceeded emissions in the first year by at least 3 percent. As a result of this and of the impossibility of banking allowances, the price of allowances crashed to less than EUR 1 per tonne CO2 in 2007. Responding to this mismatch, the Commission lowered the cap by 9.5 percent in Phase II. In Phase III, at least 50 percent of allowances were auctioned, compared to free allowances in Phases I and II. The percentage of auctioned allowances will gradually increase to reach 100 percent in 2027. The rapid growth of renewable electricity generation, combined with lower electricity demand, lower industrial output following the recession, and enhanced energy efficiency, have

resulted in reduced demand for allowances which, when coupled with relatively modest reductions in the cap, have led to very low allowance prices. In the absence of a further reduction in the cap, these prices may provide only a limited incentive for companies to undertake longer term investments to reduce emissions. As of 2010, in Ireland, the carbon tax is limited to those sectors outside of the EU ETS, as well as it excludes most emissions from farming. Instead, the tax applies to petrol, heavy oil, auto-diesel, kerosene, liquid petroleum gas (LPG), fuel oil, natural gas, coal and peat, as well as aviation gasoline.

Japan's Tax for Climate Change Mitigation covers the use of all fossil fuels such as oil, natural gas, and coal, depending on their CO2 emissions. They use CO2 emission as factor for each sector and set the tax rate per unit quantity so that each tax burden is equal to US$2/tCO2 . Mexico's carbon tax covers fossil fuel sales and imports by manufacturers, producers, and importers. It is not a tax on the full carbon content of fuels, but rather on the additional amount of emissions that would be generated if the fossil fuel were used instead of natural gas. Natural gas therefore is not subject to the carbon tax, though it could be in the future. The tax rate is capped at 3 percent of the sales price of the fuel. Companies liable to pay the tax may choose to pay the carbon tax with credits from CDM projects developed in Mexico, equivalent to the value of the credits at the time of paying the tax.

About 55 percent of Norway's CO2 emissions are effectively taxed. Emissions not covered by a carbon tax are included in the country's ETS, which was linked to the European ETS in 2008. Portugal's carbon tax of €5 per tCO2e went into effect in 2015 as part of a wider package of green tax reforms. It applies to non-EU ETS sectors and covers approximately 26 percent of the country's greenhouse gas emissionsIn May 2013 the South African government published a policy paper for public comment on introduction of a carbon tax. The paper proposes a fuel input tax based on the carbon content of the fuel. It was

agreed that emissions factors and/or procedures are available to quantify CO2-eq emissions with a relatively high level of accuracy for different processes and sectors. The carbon tax will cover all direct GHG emissions from both fuel combustion as well as non-energy industrial process emissions and is expected to start in 2016.Tax is proposed to increase by 10 percent per year until end-2019.

Sweden's carbon tax was predominantly introduced as part of energy sector reform, with the major taxed sectors including natural gas, gasoline, coal, light and heavy fuel oil, liquefied petroleum gas (LPG), and home heating oil. Over the years carbon tax exemptions have increased for installations under the EU ETS, with the most recent increase in exemption starting from 2014 for district heating plants participating in the EU ETS.

Switzerland National 2008 Switzerland's carbon tax covers all fossil fuels, unless they are used for energy. The companies might be exempted from the tax if they participate in the country's ETS.

The U.K.'s carbon price floor (CPF) is a tax on fossil fuels used to generate electricity. It came into effect in April 2013 and changed the previously existing Climate Change Levy (CCL) regime, by applying carbon price support (CPS) rates of CCL to gas, solid fuels, and liquefied petroleum gas (LPG) used in electricity generation.

The following table gives an idea about the carbon tax rates in the above mentioned countries.

Table 1: Carbon Tax Rates in Different Countries

Country/ Jurisdiction	Type	Year	Adopted Tax Rate
British Columbia	Sub national	2008	CAD30 per tCO2 (2012)
Chile	National	2014	USD5 per tCO2 (2018)
Costa Rica	National	1997	3.5 percent tax on hydrocarbon fossil fuels
Denmark	National	1992	USD31 per tCO2 (2014)
Finland	National	1990	EUR35 per tCO2 (2013)
France	National	2014	EUR7 per tCO2 (2014)
Iceland	National	2010	USD10 per tCO2 (2014)
Ireland	National	2010	EUR 20 per tCO2 (2013)
Japan	National	2012	USD 2 per tCO2 (2014)
Mexico	National	2012	Mex$ 10 -50 per tCO2 (2014)
Norway	National	1991	USD 4-69 per tCO2 (2014)
Switzerland	National	2008	USD 68 per tCO2
United Kingdom	National	2013	USD15.75 per tCO2e (2014)
Portugal	National	2014	€5 per tCO2 (2015)
South Africa	National	2016	R120/tCO2
Sweden	National	1991	USD168 per tCO2 (2014)

Source: Climate and Carbon Aligning prices and policies, OECD Environment Policy paper, October 2013 .

INDIAN SCENARIO

India's position (Ministry of External Affairs, Government of India, 2009) on climate change is based on the Principle of Common but Differentiated Responsibilities and Respective Capabilities. The concept of equity (every citizen of the globe has equal entitlement to the planetary atmospheric resource) is another crucial dimension of India's position on climate change. Further, India gives the highest priority to social and economic development even in the context of climate change, and has advocated

the convergence of per capita emissions in the future. India believes that efforts to use cleaner technologies in developing economies should be facilitated through the transfer of technology and financial resources from developed to developing countries. The use of cleaner technologies could lead to the creation of new industries and jobs. Given that small farmers constitute the bulk of agricultural households in India, any adverse effect on agricultural productivity (as a result of climate change) is likely to have a significant impact on the economy and rural livelihoods in particular. The country has witnessed high food inflation in recent times, and below average rainfall is one of the main factors for this persistently high level of inflation. Therefore, it is imperative for the country to take urgent measures to stabilize / reduce the level of emissions along with other countries.

In 2010, India made its foray into carbon pricing by introducing a small coal tax of 50 rupees (US$1) on each ton of coal produced in and imported to India, along with other market-based climate policies such as an energy efficiency trading program for major Indian industries (i.e. Perform, Achieve, and Trade (PAT) program).26 In April 2012, the Ministry of Environment and Forests went a step further to introduce a pilot carbon market in Gujarat, Tamil Nadu and Maharashtra, in order to help the regions reduce high concentrations of particulate matter. Referring to the program in its 2011-2012 annual report, the Ministry said that, "market based approaches to control environmental quality have the potential to deliver desired environmental outcomes at the lowest social cost", adding that the proposed carbon market "will set a new model for environmental regulation in India". 27 Similar to China, the Indian Government appears poised to experiment with different forms of carbon pricing before committing to a large-scale policy at the national level.

Economic Survey 2014-15 acknowledges the green actions taken by India, including imposing significantly higher taxation of petroleum

products and thereby reenergizing the renewable energy sector. India shifted from a carbon subsidization regime to one of significant carbon taxation regime, from a negative price to an implicit positive price on carbon emissions.

India has cut subsidies and increased taxes on fossil fuels (petrol and diesel) turning a carbon subsidy regime into one of carbon taxation, by putting an effective price on emissions. This has significantly increased petrol and diesel price while serving as price signal to reduce fuel burnt and hence CO2 emissions. Calculating CO2 emission reductions from measures taken for petrol and diesel suggests that there will be a net reduction of 11 million tons of CO2 emissions in less than a year compared to the baseline or 0.6 percent India's annual emissions. In addition, India has increased the coal cess from Rs. 50 per ton to Rs. 100 per ton, which is equivalent to a carbon tax of about US$ 1 per ton. A higher tax on coal offsets the domestic externalities including health cost of coal for power generation. The Economic Survey points out that any rationalization of coal pricing must take account of the implications for power prices and hence access to energy for the poorest in India which is and must remain a fundamental objective of policy. The Economic Survey observes that there is still a long way to go with potential large gains still to be reaped from reform of coal pricing and further reform of petroleum pricing policies. Broadly, the move to substantial carbon taxation combined with India's ambitious solar power program suggests that India can make substantial contributions to the forthcoming Paris negotiations on climate change.

India sets emission levels for 563 of the country's biggest polluters, such as power and, steel mills and cement plants, allowing businesses who use more energy to buy carbon certificates from those who use less. Trading has started in 2014.Nationwide, it has a carbon tax (1 July 2010) of 50 rupees/tonne ($1.07/tonne) of coal produced in and imported to India.

In comparison to many other of its Asian counterparts, India's carbon pricing schemes are ambitious. They reflect an urgent need to curb emission rates from a country that – with four times the population of the US, an economy growing 8-9 per cent a year, and surging energy demand – makes it the country with the third highest carbon emissions. Although it has refused to accept legally binding targets, India has pledged to reduce "carbon emissions intensity" - that is, carbon emissions per unit of GDP - by 20-25 percent from 2005 levels by 2020. But there are concerns about how both carbon initiatives will evolve because of a lack of data and trained manpower as well as weak penalties for firms that refuse to comply. Nonetheless, India's tax on coal is one of the first carbon taxes enacted at the national level by any major economy in the world.

POLICY RECOMMENDATIONS

The policy approach outlined here begins with an explicit recognition of the high degree of uncertainty about the rate of global warming, as evidenced by dissonant results that have accumulated over the last number of years. That uncertainty suggests small steps rather than big bang bold steps and also implies that we have more time than initially thought to find ways to mitigate its impact. The underlying principle here is that it is better to take some prudent action even if small rather than argue over grandiose actions that fail to materialize. The step proposed here, very modest carbon taxes, can be strategically crafted to strengthen and improve the search for low cost non GHG energy alternatives achieving dual desirable goals. This is only a sketch of a plan and a number of things would have to be worked out. Among them should be a mechanism to sequester the research and development fund from political capture through earmarks and other logrolling. The effort proposed in this note will likely fail if it becomes a "jobs" fund or a politicized industry subsidy program. The IIASA Global Energy Assessment is an ambitious and well done study whose purpose is to

identify means to provide world energy needs over the long term while meeting a target of limiting global warming to 2°C. That report describes an Energy Technology Innovation System that may serve as a blue print for ensuring appropriate fund development and expenditure. (Grubler *et. al.*, 2012) No doubt one objection, from those strongly convinced of global warming danger, will be that this approach is insufficient for the problem at hand and will deflect from other efforts like renewable mandates and cap and trade. They will also argue that the tax should be much higher (Nordhaus, 2008). This would be a more cogent objection were other efforts going well. Further, the proposed effort is modest enough at least initially that other initiatives could readily be continued. The hope is that policy makers will see the advantages to the proposal presented here. It is low cost and therefore low risk; it is transparent; it builds in incentives for cooperation; it has the potential for ameliorating poverty; and, its objectives are supported by those on both sides of the climate change discussion. Because the approach is incremental, it will avoid the unintended consequences of other, more grandiose schemes that have sought to achieve similar goals. (A notable example of this is the ethanol program in the U.S. which resulted in increased hunger worldwide) (Griffin and Soto, 2012). Finally, in the worst case scenario (or even middle case scenario) where the science becomes compelling, a mechanism is in place for immediate and forceful action.

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