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Introduction on nanotechnology and carbon nano tubes to reduce air pollution on large scale emissions and strategic analysis of climate change

Abstract

Air Pollution is one of the major problems that are not only hard to overcome; but also it's becoming overwhelming to humans and other living beings. Contamination of air depends on different factors such as burning of fossil fuels (coal, oil, natural gas, gasoline, etc.) and also one of the vital aspects is emissions from vehicles that only increase day by day unless we are using electric cars or water powered vehicles. This paper shows rough information to reduce air pollution through nanotechnology and strategically analysis of the climate change in the span of eighty to hundred years. Although, there are various ways to reduce air pollution but the basic concept remains same, that is, to separate specific elements and molecules from a mixture of atoms and molecules in the atmosphere at molecular level.

Keywords: nanotechnology, carbon nano tubes, air pollution, environment; emissions, climate change

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Introduction

Air pollution

Even healthy individuals can encounter health impacts including respiratory disturbance or breathing challenges amid practice or open air exercises due to contaminated air. Genuine hazard of unfriendly impacts relies upon the existing wellbeing status, the toxic type, its concentration, and length of exposure to the contaminated air.[1]

Remedy for air pollution

Ecological remediation incorporates the degradation, sequestration, or other related methodologies that outcome in reduced risks to human and natural receptors postured by substance and radiological contaminants. The advantages which emerge from utilization of nanomaterials for remediation incorporate faster cleanup of squanders. Nonetheless, financially effective remediation strategies represent a noteworthy challenge in the improvement of sufficient remediation techniques that secure the environment.[2]

Nanotechnology in air pollution

Nanotechnology takes a critical part in contamination counteractive action advances by limiting amounts and presentation of risky squanders to the air and furthermore by giving support and improvement. A groundswell of global help for creating nanotechnology as a contamination remediation strategy will proceed for a long time to come.[2]

Methodology of carried out research

A Climate Simulation was performed for our environment till 2100 years.

Emissions

(Figure 1–8)

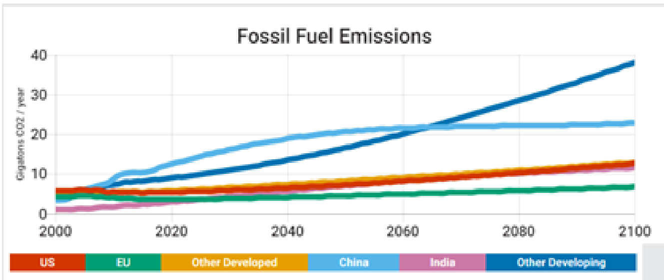

Figure 1 Fossil fuel emissions for US, EU, China, India.

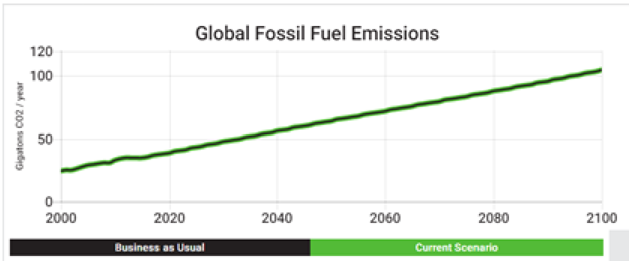

Figure 2 Global fossil fuel emissions for US.

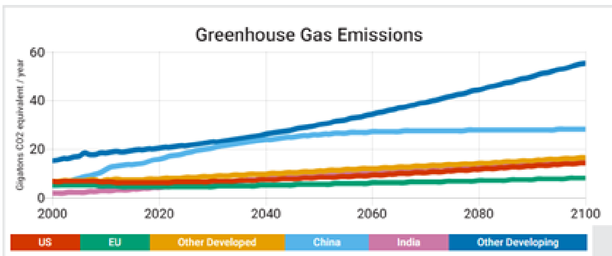

Figure 3 Greenhouse gas emissions for US, EU, China, India.

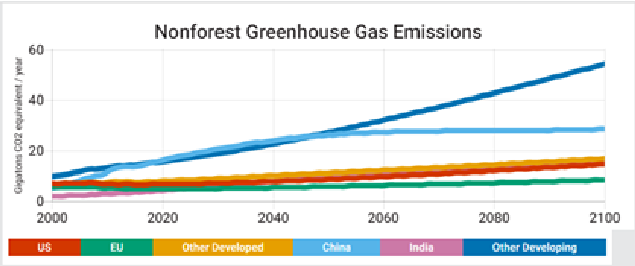

Figure 4 Non forest greenhouse gas emissions for US, EU, China, India.

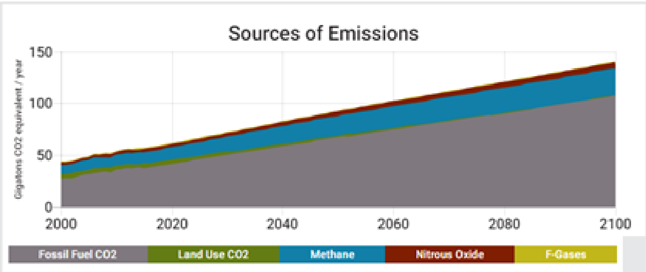

Figure 5 Sources of emissions that includes fossil fuel CO_2, Land Use CO_2, Methane, Nitrogen Oxide, F- gases.

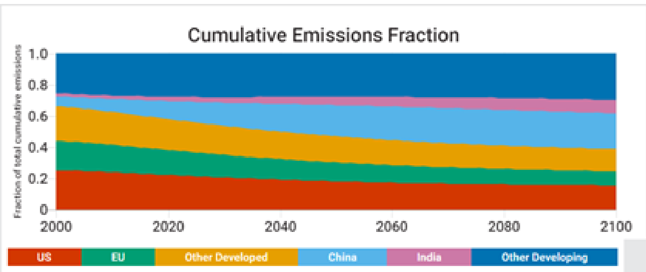

Figure 6 Cumulative Emissions Fraction for US, EU, China, India.

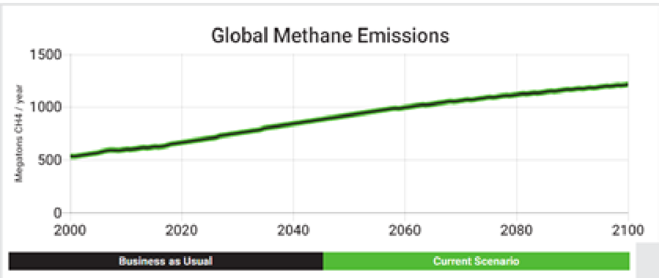

Figure 7 Global Methane Emissions.

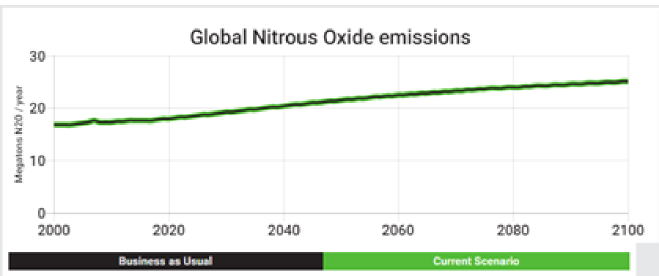

Figure 8 Global Nitrous Oxide.

Projections

(Figure 9–16)

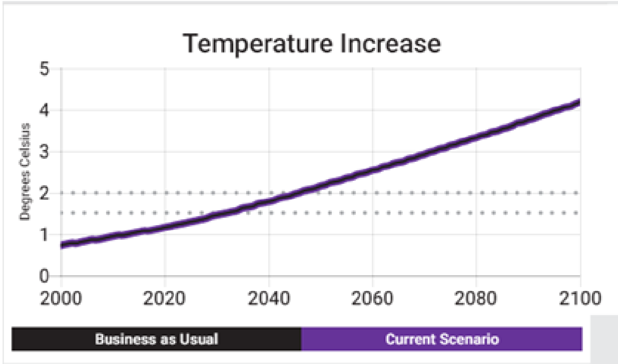

Figure 9 Increase in temperature.

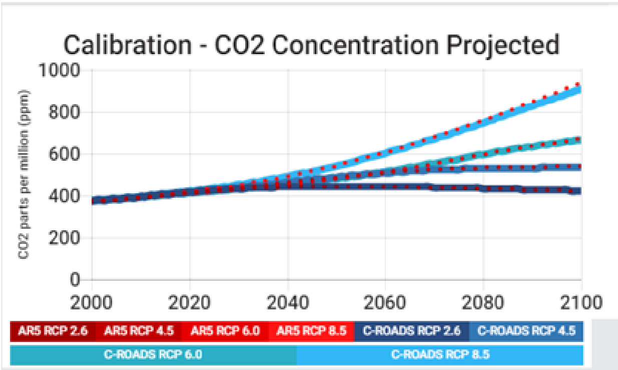

Figure 10 Calibration–CO_2 concentration projected.

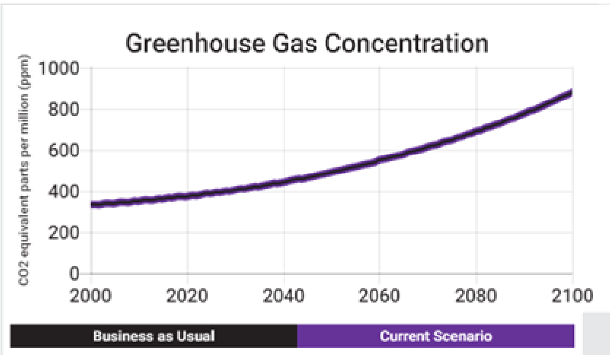

Figure 11 Greenhouse gas concentration.

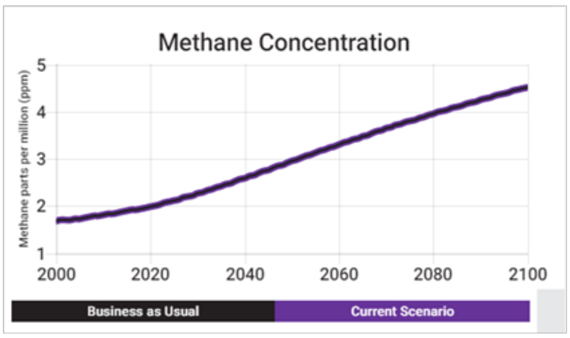

Figure 12 Methane Concentration.

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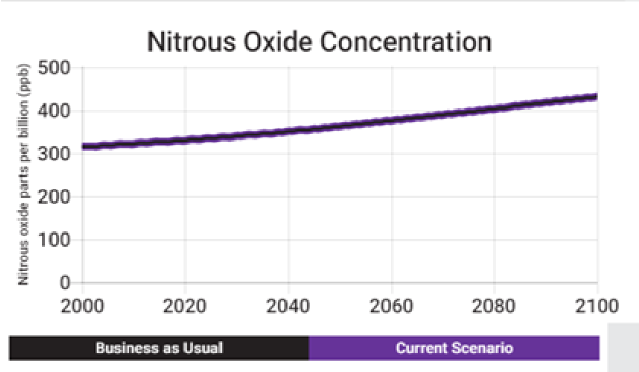

Figure 13 Nitrous Oxide Concentration.

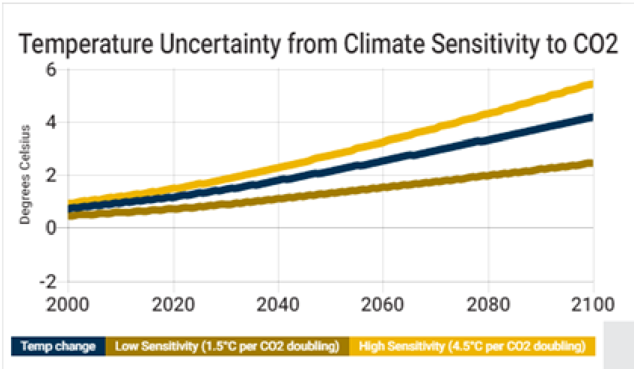

Figure 14 Temperature uncertainty from climate sensitivity to CO_2.

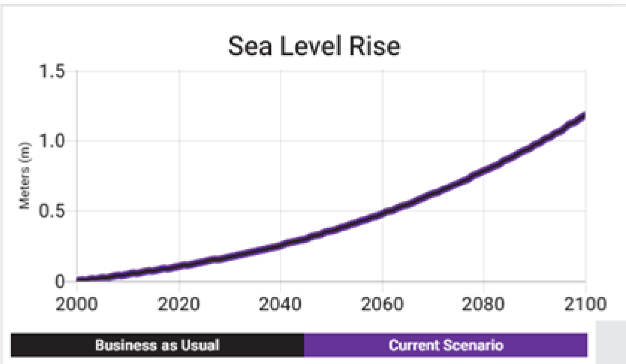

Figure 15 Sea level rise.

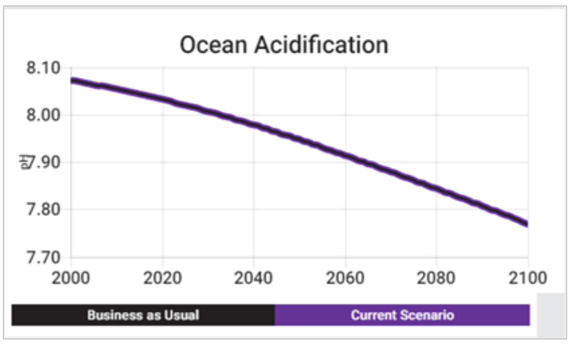

Figure 16 Ocean acidification.

Notes:

Assumptions and Sensitivities

Climate Sensitivity: 3.0 C

Ocean Mixing: 1.0 (ratio)

CO_2 Fertilization: 1.0 (ratio)

Biomass Loss from Afforestation: 1.0 (ratio)

Sea Level Rise from Ice Sheet Melting: 0.0 mm/yr

Carbon Cycle Land and Ocean Uptake: 1.0 (ratio)

Methane Emissions from Biological Activity: 0.0 (ratio)

Methane Emissions from Permafrost and Clathrates: 0.0 (ratio)

Temperature Threshold for Permafrost and Clathrates: 1.0 C

Interpretation of the graphs

If looked closely to the graphs; author notes that there are significant changes to our environment in span of years. Although, assumptions and sensitive's were kept constant. If any of the values changes, then there would be adverse effects to the environment in the span of 80 to 100 years.

Air pollution reduction through nanotechnology

There are many ways to reduce air pollution through nanotechnology, in that, two major ways in which nanotechnology can be used to reduce air pollution: catalysts, and nano–structured membranes.

Air pollution through automobiles

In principle, burning any sort of hydrocarbon fuel with oxygen from the air, discharges a considerable measure of energy and breaks up in carbon dioxide and water, which are perfect and generally safe. Practically speaking, however, there might be too little oxygen (or excessively) or there might be polluting influences in the engine or the fuel that is consuming. That implies air contamination as a result. The toxin gasses made via auto mobiles incorporate a noxious gas called carbon monoxide, and in addition VOCs (volatile organic compounds) and nitrogen oxides that reason brown haze called "smog".

Nano catalyst for air pollution

Catalyst can be utilized to empower a substance response (which transforms one kind of molecule to another) at low temperatures or make the response more successful. Nanotechnology can enhance the execution and cost of catalyst used to change vapors getting away from auto mobiles or modern plants into innocuous gasses. That is on account of energy produced using nanoparticles have a more noteworthy surface zone to cooperate with the responding chemicals than energy produced using bigger particles. The bigger surface range enables more chemicals to cooperate with the impetus at the same time, which makes the catalyst more powerful.

Nano catalytic convertor

Toxin gasses are made of harmful particles, yet those particles are produced using moderately harmless atoms. So in the event that we could discover a method for split up the atoms after they leave an automobile and before they get drew out into the air, we could solve the issue of pollution. That is the activity that an exhaust system does.[4,5]

Nano structured membranes

Nanostructured membranes can be used to separate carbon dioxide from industrial plant exhaust streams. The plan is to create a method that can be implemented in any power plant without expensive retrofitting (Figure 17–19).

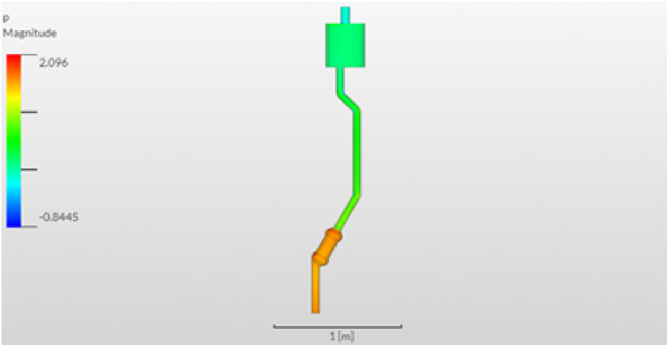

Figure 17 A simulation of a catalytic convertor.[6]

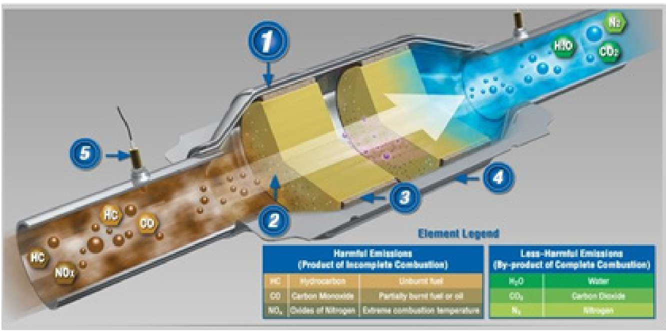

Figure 18 Depicts a traditional catalytic convertor.7

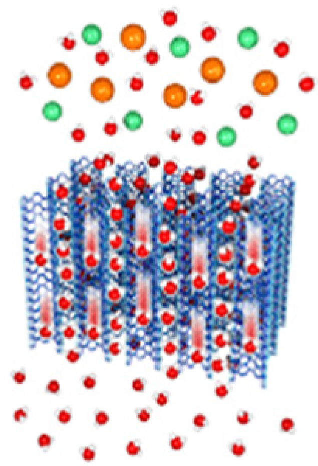

Figure 19 Depicts a Nano structured Membranes.8

Strategic analysis of climate changes

A simulation was performed for the climate changes in the span of 80 to 100 years.

Strategic priorities and mitigation with graph

(Figure 20–27)

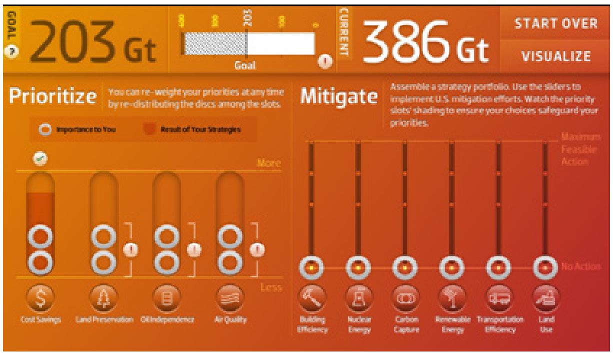

Figure 20a Depicts when priorities (cost savings, land preservation, oil independence, air quality) are at minimal and mitigation (building efficiency, nuclear energy, carbon capture, renewable energy, transportation energy, land use) are at minimal.

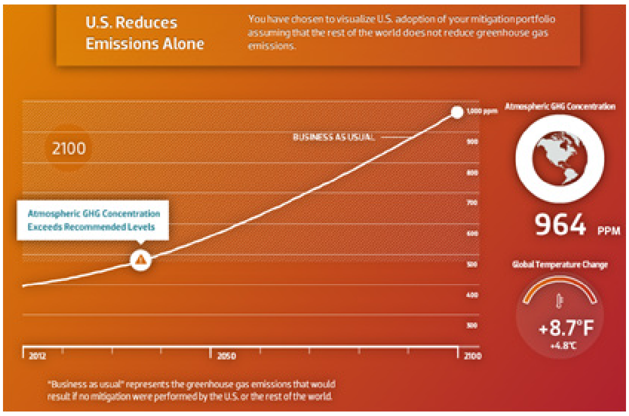

Figure 20b Depicts the graph generated for the atmospheric GHG concentration of 964 PPM and with an increase in 8.7 F in temperature.

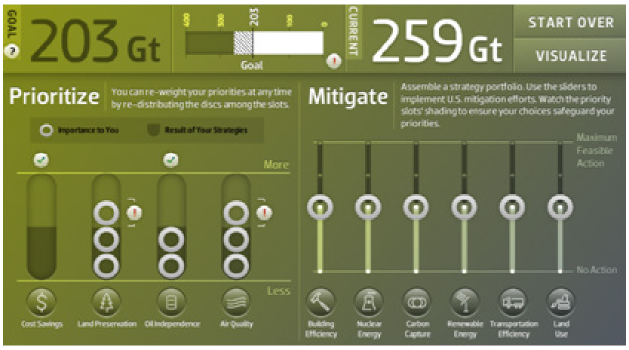

Figure 21a Depicts when priorities (cost savings, land preservation, oil independence, air quality) are moderate except cost savings and mitigation (building efficiency, nuclear energy, carbon capture, renewable energy, transportation energy, land use) are at moderate

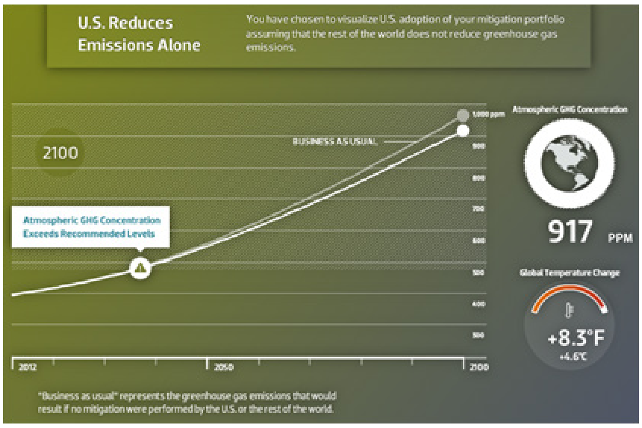

Figure 21b Depicts the graph generated for the atmospheric GHG concentration of 917 PPM and with an increase in 8.3 F in temperature.

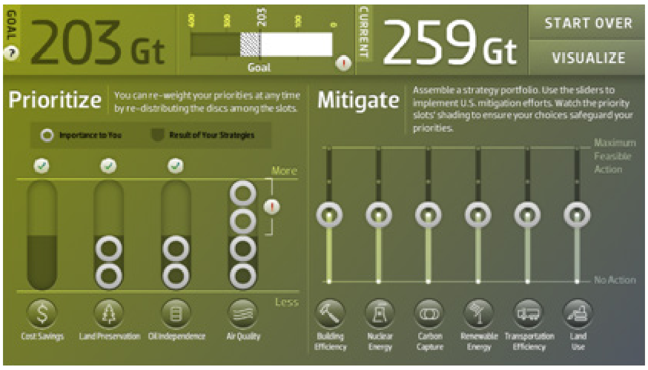

Figure 22a Depicts when priorities (cost savings, land preservation, oil independence, air quality) are at moderate except cost savings and air quality giving highest priority and mitigation (building efficiency, nuclear energy, carbon capture, renewable energy, transportation energy, land use) are at moderate.

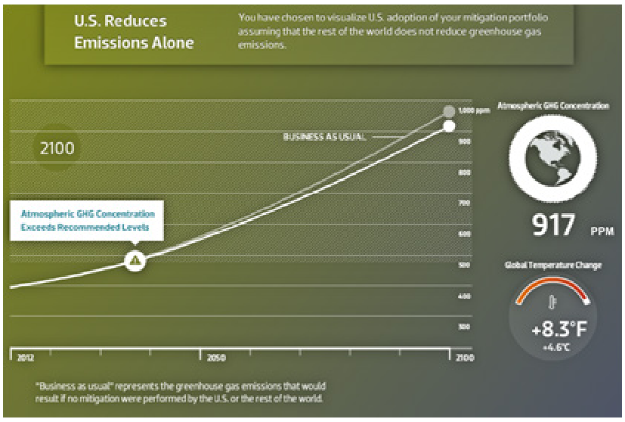

Figure 22b Depicts the graph generated for the atmospheric GHG concentration of 917 PPM and with an increase in 8.3 F in temperature.

Color codes

a. The background color of Graph 20 (a), (b) is red because that is the danger zone that means prioritize and mitigate is at minimal that would only increase air pollution and will not help in improving.

b. The background color of Graph 21 to 23 is dark green that is medium zone that means prioritize and mitigate is at medium

c. The background color of Graph 24–27 is bluish green that is safe zone that means prioritize and mitigate is at high and that would help to reduce air pollution at maximum.

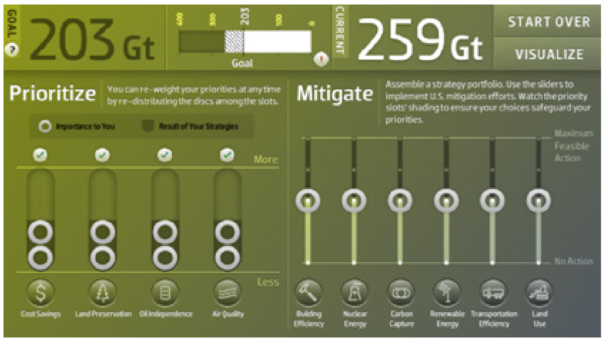

Figure 23a Depicts when priorities (cost savings, land preservation, oil independence, air quality) are minimal and mitigation (Building efficiency, nuclear energy, carbon capture, renewable energy, transportation energy, land use) are moderate.

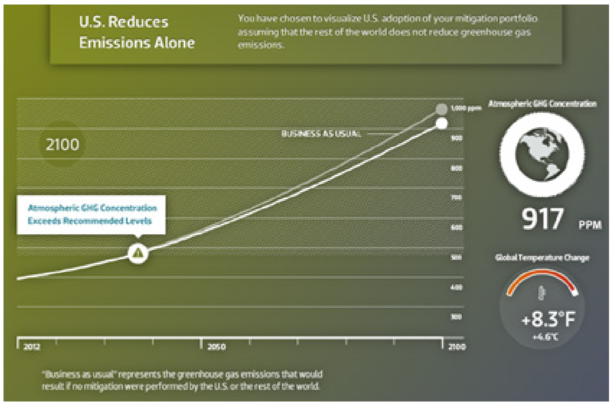

Figure 23b Depicts the graph generated for the atmospheric GHG concentration of 917 PPM and with an increase in 8.3 F in temperature.

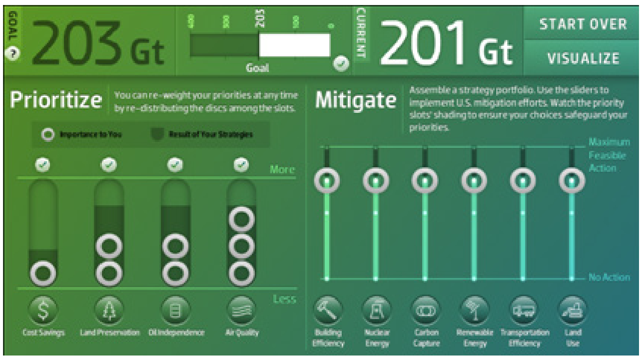

Figure 24a Depicts when priorities (Cost Savings, Land Preservation, Oil Independence, Air Quality) are minimal except cost savings and mitigation (Building Efficiency, Nuclear Energy, Carbon Capture, Renewable Energy, Transportation Energy, Land use) are high.

Notes

a. Graphs from Figure 20–26 are for U.S. adoption of mitigation assuming that the rest of the world does not reduce greenhouse gas emissions.

b. Graph of Figure 27 are for U.S. adoption of mitigation assuming that the rest of the world reduces their emissions by the same percentage.

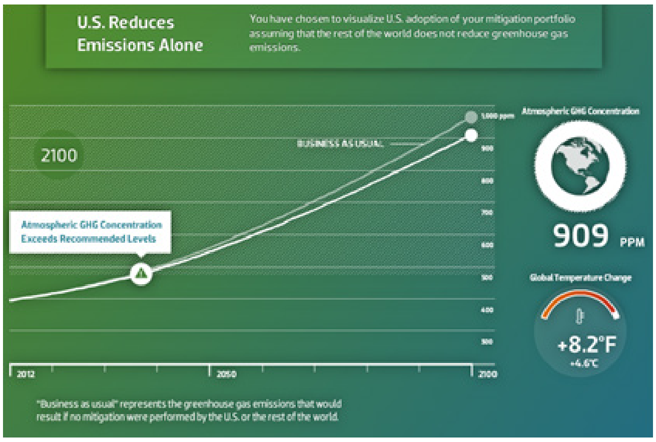

Figure 24b Depicts the graph generated for the atmospheric GHG concentration of 909 PPM and with an increase in 8.2 F in temperature.

Figure 25a Depicts when priorities (cost savings, land preservation, oil independence, air quality) are high except cost savings and mitigation (building efficiency, nuclear energy, carbon capture, renewable energy, transportation energy, land use) are at maximum feasible action.

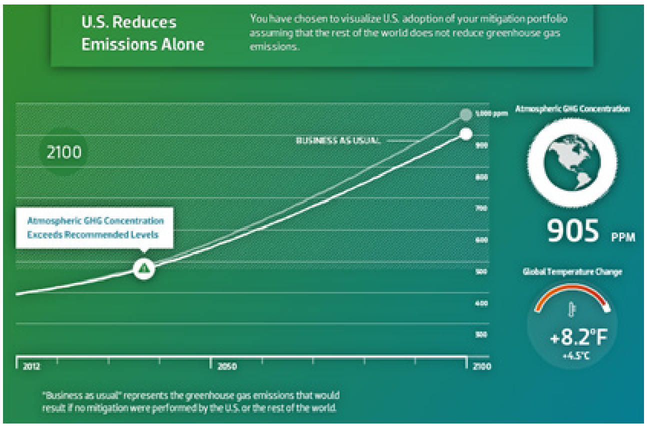

Figure 25b Depicts the graph generated for the atmospheric GHG concentration of 905 PPM and with an increase in 8.2 F in temperature.

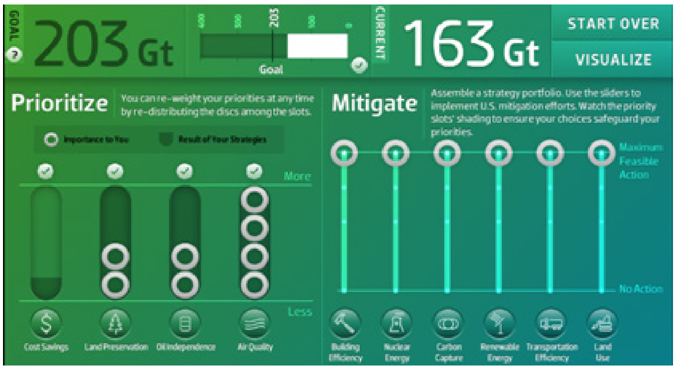

Figure 26a Depicts when priorities (cost savings, land preservation, oil independence, air quality) are high, air quality having maximum priority except cost savings and mitigation (building efficiency, nuclear energy, carbon capture, renewable energy, transportation energy, land use) are at maximum feasible action.

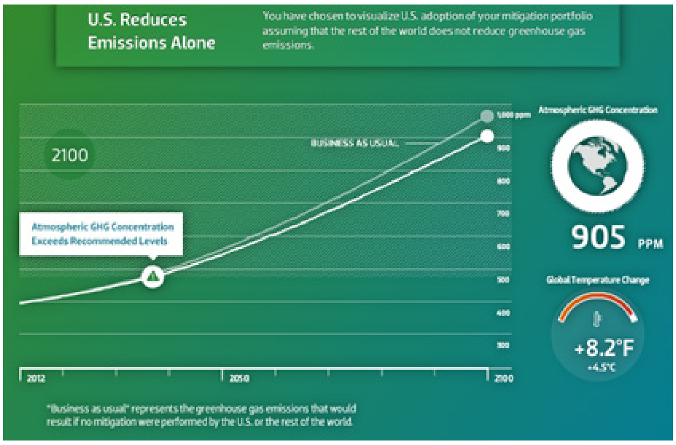

Figure 26b Depicts the graph generated for the atmospheric GHG concentration of 905 PPM and with an increase in 8.2 F in temperature.

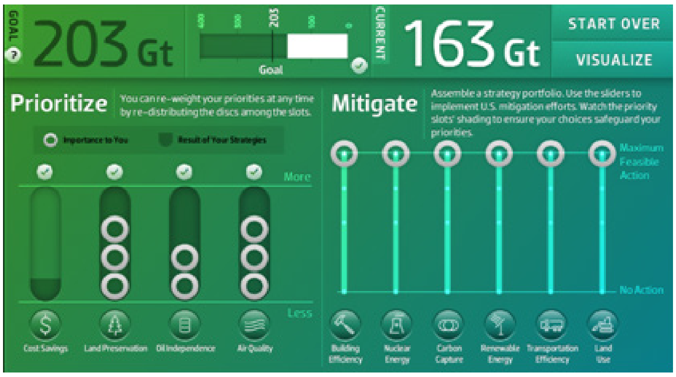

Figure 27a Depicts when priorities (cost savings, land preservation, oil independence, air quality) are high, except cost savings and mitigation (building efficiency, nuclear energy, carbon capture, renewable energy, transportation energy, land use) are at maximum feasible action.

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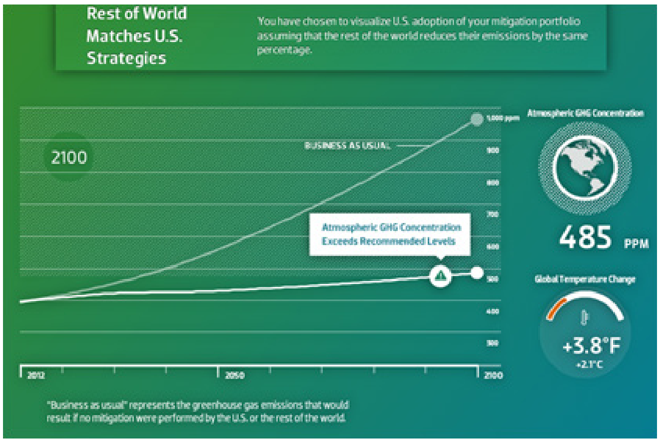

Figure 27b Depicts the graph generated for the atmospheric GHG concentration of 485 PPM and with an increase in 3.8 F in temperature.

Results and in depth discussions

Results and interpretation of the strategic analysis graphs

Based on the graphs for Figure 20–26; although, we cannot reduce emissions and global temperature change completely but if we give highest priority to Air Quality and least priority to Land Preservation, Oil Independence and no priority to Cost Savings and mitigation of Building Efficiency, Nuclear Energy, Carbon Capture, Renewable Energy, Transportation Energy, Land use to maximum feasibility action then we may be able to achieve Atmospheric GHG concentration at minimum of 905 PPM and Global temperature of 8.2 degree F in the span of 80 to 100 years. Based on the graph for Figure 27 If rest of the world reduces their emissions by the same percentage as US adoption of mitigation then we may be able to achieve Atmospheric GHG concentration as low as 485 PPM and Global temperature as low as 3.8 degree F in the span of 80 to 100 years.[6–9]

Discussions on future projections

a. Climate Simulations for emissions are plotted like Fossil Fuel Emissions, Global Fossil Fuel Emissions, Greenhouse Gas Emissions, Non forest Greenhouse Gas Emissions, Sources of Emissions, Cumulative Emissions Fraction, Global Methane Emissions, Global Nitrous Oxide Emissions.

b. Climate Simulations for projections are plotted like Increase in temperature, Calibration–CO_2 Concentration Projected, Greenhouse Gas Concentration, Methane Concentration, Nitrous Oxide Concentration, Temperature Uncertainty from Climate Sensitivity to CO_2, Sea Level Rise, Ocean Acidification.

c. Nano catalyst can be used to reduce air pollution especially for Automobiles.

d. Nano structured membranes can be used to separate carbon dioxide from the mixture in the atmosphere at molecular level.

e. Strategic Analysis for Climate was plotted for priorities (Cost Savings, Land Preservation, Oil Independence and Air Quality) and mitigation (Building Efficiency, Nuclear Energy, Carbon Capture, Renewable Energy, Transportation Energy, Land use) with changing priorities and mitigations.

Conclusion

What is claimed in this are

a. Strategic Analysis for Climate was plotted for U.S. adoption of mitigation assuming that the rest of the world does not reduce greenhouse gas emissions and U.S. adoption of mitigation assuming that the rest of the world reduces their emissions by the same percentage.

b. If no action taken for present environment then Highest Atmospheric GHG concentration achieved was 964 PPM and increase in temperature of 8.7 degree F in span of eighty to hundred years for US.

c. If all the action taken for present environment at maximum level then lowest Atmospheric GHG concentration achieved was 905 PPM and temperature increase of 8.2 degree F in span of eighty to hundred years for US

d. If all the action taken for present environment at maximum level then lowest Atmospheric GHG concentration achieved was 485 PPM and temperature increase of 3.8 degree F in span of eighty to hundred years for rest of world reduces their emission by same percentage.

Acknowledgments

None.

Conflicts of interest

None.

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