

(RESEARCH ARTICLE)



Method to achieve carbon neutral and to fit Paris agreement and to protect global warming

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Abstract

Global warming is caused by lack of N and P by the elimination of NO_x and NP in seven developed countries. Global warming can be protected, if enough amounts of nutrients containing nitrogen and phosphorous are supplied. Most easily available substances containing N and Pare NO_x and NP in waste water. If developed countries stop the elimination of NO_x and NP, CO₂ assaulting is activated and global warming will stop. In addition, production of grain and fish will increase and GDP, national wealth and population will increase. The goal "CO₂ zero and growth" described in Paris Agreement could be accomplished sooner than 2050. Complete use of nitrogen and phosphorous is essential for protection of global warming and for growth.

Keywords: NO_x; CO₂ assimilation; Carbon neutral; Global warming protection ratio GWPR Protection of global warming

1 Introduction

NO_x of exit gas of car is hated as toxic gas and set a law to eliminate NO_x completely this law is extended to exit gas of the factory such as electricity generation plant at 7 developed countries. Japan followed this rule most completely. I wish to insist that NO_x elimination should be stopped. Because toxicity of NO_x is not so serious compared with significant merit of NO_x. NO_x is essential for plant to grow and produce food. NO_x is essential for the promotion of CO₂ assimilation and essential for the production of foods for the promotion of health and long life for the protection of global warming

Paris agreement ask us $CO_2em = CO_2fix$, $GWPR = 1$ Carbon neutral

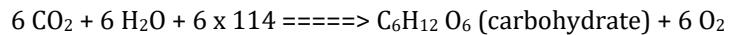
To fit Paris agreement, we must lower CO₂ em or increase CO₂ fix. Developed countries are just trying to lower CO₂ increase.. And they are not trying to increase CO₂ fix.

By activating CO₂ assimilation, we can change CO₂ to carbohydrate, rice, grain, plankton and fish. And we can increase CO₂ fix. 7 developed countries are eliminating nitrogen and phosphorous then CO₂ assimilation is retarded by the lack of nitrogen and phosphorous. CO₂ fix is retarded and CO₂ increased.. Elimination of NO_x and NP should be stopped for the protection of global warming. [1-54].

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2 Global warming and CO₂ increase can be protected by stopping NO_x NP elimination

Paris agreement ask carbon neutral, CO₂ increase zero and growth (I prefer term CO₂ increase zero than CO₂ emission zero.) CO₂ assimilation is a reaction of CO₂ with water to produce carbohydrate and oxygen



CO₂em (CO₂ emission) are produced by burning of wood, fossil fuel and respiration. Produced CO₂ is fixed to CO₂fix by CO₂ assimilation.

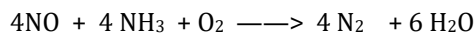
The author defined the ratio of CO₂ em and CO₂fix as GWPR (global warming protection ratio)

$$\text{GWPR} = \text{CO}_2\text{em}/\text{CO}_2\text{fix}$$

To fit Paris agreement, we must lower CO₂ em or increase CO₂ fix. Developed countries are just trying to lower CO₂ increase.. And they are not trying to increase CO₂ fix.

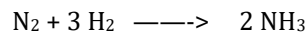
By activating CO₂ assimilation, we can change CO₂ to carbohydrate, rice, grain, plankton and fish. And we can increase CO₂ fix. 7 developed countries are eliminate 60 hm tone NO_x and NP in waste water by following methods.

NO_x is eliminated by blow in ammonia to the exit gas.



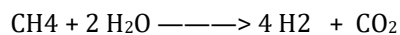
60 hm t 3.4 hm t

3.4 hm t NH₃ is made from 0.6 hm t H₂



0.6 hm t 3.4 hm t

0.5 hm t H₂ is produced from CH₄ with 3.3 hm t CO₂



0.6 hm t 3.3 hm t

In such way fertilizer NO is eliminated by other fertilizer NH₃. Then CO₂ assimilation is blocked double ways (60 + 3.4) x 25 = 1585 hm t carbohydrate production is blocked. And 3.3 hm t CO₂ is produced.(50,51)

Nitrogen and phosphorous in waste water are eliminated by activated sludge process. World is presumably eliminating N and P 20 times of Japan. 3318 million tone x 20= 6.63 million tone nitrogen and 119x 20= 2393 million tone phosphors are eliminated at waste water purification center. 2393110 x 20=2200 billion kWh electrocute is consumed for the treatment of waste water of the world. If waste water purification is not done at developed countries, 6.63x 20= 132.6 billion tone CO₂ can be fixed. And 132.6/20 = 6.6 billion tone fish will be caught.

CO₂ assimilation is most important reaction. N and P are most important substances.

Elimination of nitrogen and phosphorous retard CO₂ assimilation by the lack of nitrogen and phosphorous. CO₂ fix is retarded and CO₂ increased. Elimination of NO_x and NP should be stopped for the protection of global warming. [1-54]

W.Nordhaus (Winner of Nobel Economic Science 2018) (55) proposed theory that global warming is due to increase of CO₂, Carbon emission reduction, decarbonization is necessary. But this theory is wrong. CO₂ assimilation is a reaction of CO₂ with water .and increase of CO₂ is favorable for Increase of green area (56-62). CO₂ must be reduced by CO₂assimilation. CO₂ assimilation can be activated by supply of enough nitrogen and phosphorous .Elimination of N, P retard CO₂ fix and food production.

Japan government consider that decrease of CO₂ emission, decarboxylation is only way to protect global warming and use of hydrogen as no CO₂ generating compound. And put emphasis of study on hydrogen (63) and spending much money for manufacturing hydrogen from coal at Australia. (64). Decrease of CO₂ must be done by promotion on CO₂ assimilation and not by decarbonization

Very warm day are continuing and CO₂ is increasing. Seven developed countries considered NO_x as toxic substance and eliminate 4 hm ton NO_x by ammonia Then CO₂ assimilation is retarded CO₂ fix is retarded and heat absorption is retarded and global warming increased.

CO₂em (CO₂emission), NO_x (NO_xproduction), NO_xc (NO_x concentration at exit gas), W.dump (Wastewater dumping), GWPR (global warming protection ratio), GDP (GDP ratio at2021/1991) of 13 countries are shown in Table 1

Table 1 CO₂em, NO_x NO_xcon, W.Dump, Area, Fixable CO₂, GWOR, GDP of 13 countries

| Country | CO ₂ em | NO _x | NO _x con | W.dump | Area | Fixable CO ₂ | GWPR | GDP |
|-------------|--------------------|-----------------|---------------------|-----------|-----------------------------|-------------------------|------------|------------|
| | hmt | hmt | g/kWh | | km ² | bill t | 2021/1991 | |
| World | 510 | 16.5 | | | | | | |
| China | 106.4 | 4.25 | 1.6 | do | 1.0x 10 ⁷ | 100 | 1.0 | 51.1 |
| India | 24.6 | 1 | 1.6 | do | 3.2x 10 ⁶ | 32 | 0.76 | 11.1 |
| Indonesia | 5.0 | 0.2 | 1.6 | do | 1.9x 10 ⁶ | 19 | 0.3 | |
| USA | 51.0 | 2 | 0.5 | no | 9.5x 10 ⁶ | 95 | 0.53 | 3.7 |
| Japan | 12.5 | 0 | 0.1 | no | 3.8x 10 ⁵ | 3.8 | 3.3 | 1.1 |
| Russia | 19.6 | 0.63 | | | 3.2x 10 ⁶ | 32 | 0.61 | |
| Germany | 7.8 | 0.31 | 1.0 | no | 3.5x 10 ⁵ | 3.5 | 2.2 | 4.3 |
| U. K | 4.0 | 0.16 | 1.3 | no | 2.4 x 10⁴ | 2.4 | 1.7 | 3.3 |
| Italy | 3.5 | 0.14 | 0.5 | no | 2.0x 10 ⁵ | 3.0 | 1.2 | |
| France | 3.3 | 0.13 | | no | 6.4x 10 ⁵ | 8.4 | 0.4 | |
| Canada | 5.6 | 0.22 | 1,3 | no | 1.0x 10 ⁸ | 100 | 0.06 | |
| Iran | 6.3 | 0.25 | | | 1.6x 10 ⁶ | 1.6 | 3.9 | |
| Turkey | 4.0 | 0.16 | | | 7.8x 10 ⁵ | 7.8 | 0.5 | |

Developing countries like China, India and Indonesia do not eliminate NO_x and do not dump waste water and use NO_x and NP as fertilizer. They can accelerate CO₂ assimilation. They can fix CO₂ produced at their countries. Therefore GWPR is less than 1. GDP ratio 2021/1991 is over 5. China GWPR 1.0, GDP ratio 2021/1991 is 51.1 India GWPR 0.76 GDP ratio 11.1 Indonesia GWPR 0.3

Developed country eliminate NO_x and waste water NP. Then GDP ratio 2021/1991 is low USA 3.7, Japan 1.1, Germany 4.3, UK 3.3. Japan started NO_x , NP elimination then CO₂ assimilation is blocked . Fish industry and agriculture are blocked and national wealth decreased much.

The countries who have wide green area can fix much CO₂ than emission they can have low GWPR than 1. Indonesia GWPR 0.3, USA 0.53, Russia 0.51, Canada 0.06

NO_x is hated as pollution gas causing illness. Many governments' mis understand the usefulness of NO_x and set up very strict law to eliminate NO_x in burned gas and forced to eliminate NO_x using ammonia. I wish to insist that NO_x elimination should be stopped. Because toxicity of NO_x is not so serious compared with significant merit of NO_x. NO_x is essential for plant to grow and produce food. NO_x is essential for the promotion of CO₂ assimilation and essential for the production of foods for the promotion of health and long life for the protection of global warming ((26, 27, 41-54)

3 Nature have three systems to provide nitrogen. One is NO_x produced by thunder. Two is forest fir. Three is typho

3.1 Thunder produce NO_x, yellowtail, crab and delicious rice

Thunder produce NO_x from N₂ and O₂. (7, 64-70). About 4 million thunder in one day and about 30×10^6 t NO_x is produced by thunder in one year and about 20-80% of NO_x is produced by thunder in the world.

3.2 Forest Fir

Slash and burn agriculture is carried out for many thousand years in the world.

Wood is burned and wood turn to the field which can produce crops. Ash produced by burning is said to be effective substance. But main effective substance is NO_x. When tree 1000 tone is burned, $1000/25 = 40$ tone NO_x is produced. And 40 tone NO_x can grow $40 \times 25 = 1000$ tone plant. By burning of something, by cooking of rice, by burning of tree for worm up the room, by burning of straw, by bonfire, by mountain fire, by bank burning, by fire festival something / 25 = NO_x tone is produced [4,7,37].

Natural forrest fir are happening at many places. Yosemite park Caolornia 69 km² at UK.

This kind of natural fir might be happening to increase food, Forest fire at Brazil is now big topics. Brazil government are trying to convert tropical rainy forest to agriculture land. 3.8×10^5 Km² forest is now changing to farm yearly. This kind of action is done at Africa and at Russia at Indonesia and at Malaysia. In this process, forest is burned and agriculture land is made. By changing forest to firm, valuable crops, food is produced. In the process of burning, forest fir can happen. Many people say this process is destroying forest and produce much CO₂ and progressing global warming.

But I think to convert forest to firm land must be evaluated by comparing the merit and demerit.

Slash and burn agriculture have big merit. Burning of wood produce much fertilizer. When 1000 kg dry timber is burned, $1000 \times 44/30 = 1470$ kg CO₂ is produced and $1470 \times 1/25 = 58.8$ kg NO_x is produced. 1470 kg CO₂ and 58,8 kg NO_x will produce $58.8 \text{ kg} \times 25 = 1470 \text{ kg}_2$ plant by CO₂ assimilation.

Weight of vegetation of world increased about 2 times since the industrial revolution, Green area increased very much since these several 10 years.

Zaichun Zou reported the change of global change of leaf area from 1982 - 2009. Total area of increased green is 18 million km², double of USA area [56].

The increase of CO₂ and NO_x production increased the CO₂ assimilation. The increase of CO₂ assimilation increased the production of grain and fish. The production of grain in 1960 0.85 billion tone in 2010 2.6 billion tone 3 times. Slash and burn agriculture might contribute for the increase of food production.

When 1000 tone tree is burned, $1000 \times 264/180 = 1470$ tone CO₂ and $1470/25=59$ tone NO_x is produced.59 tone NO_x can produce $59 \times 25=1475$ tone plant. When forest id burned new plant can grow quickly by absorbing NO_x. Population is increasing toward 10 billion in next 20 years. We must increase food production.

We must increase the land which can produce food. We must change forest to farm land. We must increase fertilizer. NO_x is most easily available fertilizer. By burning tree produce CO₂ and NO_x. 3.8×10^5 Km² Forest tree have capacity to fix $1000 \times 3.8 \times 10^5$ CO₂ tone Forest tree turned = 3.8×10^8 tone CO₂ is released. When these tree is burned, and $3.8 \times 10^8 \times 1/25$ tone NO_x is produced. These $3.8 \times 10^8 \times 1/25$ tone NO_x can produce $3.8 \times 10^8 \times 1/25 \times 25 = 3.8 \times 10^8$ tone plant which produce food. Therefore, forest burning is production of farm. When forest burning is carried out properly and safe. Forest burning is not bad and should be welcomed and recommended.

Nature has systems to change N₂ to nutrient nitrogen. By the high temperature at fire place for cooking, warming up of room by burn- ing of wood, by forest fire, by forest burning, by bonfire and also burning of fossil fuel, following reactions proceed producing much CO₂. About 1.5 billion tone CO₂ is produced for the production of H₂. Two is elim inating of 35

million tone nitrogen at 22 wastewater purification plant. Third is elimination of 25.5 million tone NO at garbage burning plant. Total $50 + 35 + 25 = 1.11$ billion tone neutrinos nitrogen in Japan.

Population of Japan is 1.2 billion. By this rule, 50 million tone NO_x emission stopped. And one billion tone CO₂ assimilation is retarded. 2

Fish, rice, vegetable and fruit production retarded. Population of rural district decreased. Japan produced 11.5 million tone fish, top in the world in 1984 but fish production decreased to 3.5 million ton 7th place in 2018. This 800 million tone is huge decrease by decrease of plankton by decrease of N nitrogen concentration of sea water. Japan is eliminating 0.5 billion tone NO_x since 1984. Fish price increased 1960 0.3 USD/kg, 1970 0.5 USD/kg, 1980 1 USD/kg, 1990 2 USD/kg, 2000 3 USD/kg, 2010 4 USD/kg, 2018 8 USD/kg. Price of 8 million tone fish is $8 \times 8000000000 = 640$ billion USD. Japan losing fish 640 billion USD (540 USD per person) each year [31]. About 2 million fisherman lost job. Since Japan started NO_x elimination and NP elimination in 1980, agriculture and fish industry declined remarkably. GDP growth rate increased only 1.6% from 1985 to 2017. Government debt balance/DGP is 237%, worst in 188 countries. NO_x elimination and NP elimination should not be done to protect decline of food production.

The countries who use NO_x, NP are growing and increasing population. The countries who eliminate NO_x, NP are declining and decreasing population [32]. DGP, food and population can be increased by effective use of NO_x and NP [16, 19, 21, 32, 40-54].

3.3 Typhoon agitate deep sea water (rich in nutrient N, P) with shallow sea water (poor N,P)

About 70 % CO₂ assimilations of the world are carried out at sea. About 70 % CO₂ assimilation is carried out by plankton. About 70% plankton CO₂ assimilation is carried out at cold sea (about 20% of total sea) where counter current between cold surface sea water (poor nutrient) with hot bottom sea water (rich nutrient) is possible. As plankton growth infinitely if enough nutrient N and P are present. If agitation of deep sea water with shallow sea water is done at more wide area of the sea, we can promote plankton growth at more wide area of sea and we can fix more CO₂ and we can get much more fish. Annual CO₂ fix by ocean plankton in the world is 2×10^{10} tone. Therefore fixing of CO₂ by plankton at sea is most important. Concentration of N and P of surface sea water at 100km south of Muroto (South corner of Shikoku) is 1 μg/l, 0.3 μg/l. respectively. N 33 μg/l, P 2.9 μg/l at 1000m deep sea, water are 30 times and 10 times rich in nutrition than that of surface sea water. Coral bleaching is reported at Great Barrier Reef in 2016 June 6. Coral bleaching is reported at Sekisei Reef Lake at Okinawa at Japan. They say coral bleaching is caused by warm water. But I think this is caused by lack of nutrient NP by insufficient agitation of neutering rich deep sea water with shallow sea waters by typhoon, when no typhoon coral bleaching happen. Typhoon is accelerating CO₂ assimilation by increase of the supply of N, P

Global warming produce high temperature of sea water, evaporation of watering consequent many typhoon, hurricane. These typhoon and hurricane agitate surface of sea water (poor nutrient) with deep sea water (rich nutrient). Plankton growth infinitely if enough N and P are present. Many hurricane attacking west south part of United State producing much plankton and fish absorbing much CO₂ and heat to cool down the earth. Typhoon and hurricane are necessary phenomena given by nature.

3.4 Le Chaterrier's principle is working at Nature

High temperature is caused by global warming. Then evaporation of sea water cause hurricane and typhoon. Hurricane and typhoon agitate surface of sea water and give enough N and P to promote CO₂ absorption to promote CO₂ assimilation, to promote the growth of plankton and promote CO₂ absorption and heat absorption to cool down down the earth. We must study and find out best method to agitate sea water. By the use of wind, sea current, attraction of moon.

Agitation or stirring of sea water by using current power or wind power or construction of fence must be studied to increase the concentration of N and P at surface..

Global warming is produced by stopping of NP elimination, activating recycle of NP. . Therefore return to the year before 1980 of no NP elimination. If we stop the elimination of NP CO₂ assimilation become active. The increase of CO₂ fix mean increase of food production. Increase of food lead to the prosperity of countries and local district. Global warming will not happen.

4 Global warming and CO₂ increase can be protected by stopping NO_x elimination

Very warm day are continuing and CO₂ is increasing. Seven developed countries considered NO_x as toxic substance and eliminates 4 hm ton NO_x by ammonia Then CO₂ assimilation is retarded CO₂ fix is retarded and heat absorption is retarded and global warming increased.

Ammonia is produced from hydrogen and nitrogen. Hydrogen is produced from natural gas producing much CO₂. Then CO₂ increased.

4.1 NO_x Elimination and NP Elimination are Promoting Global Warming

NO_x elimination can be found by NO_x concentration of exit gas. 1.6 g/kWh is no elimination. 0 g/kWh is complete elimination No NO_x elimination countries like China, India, Indonesia show low GWPR and high GDP growth rate. On the contrary, high NO_x eliminating country like Japan (3.4 1.03), Germany (2.2 1.83) UK (1.7, 1.8), Italy (1.2, 0.88) show high GRPR and low GDP growth rate.

Japan is eliminating NO_x, NP most severely. NO_x concentration at exit gas is 0 g/kWh. Then fish production decreased from 12 million tons in 1970 to 2 million tons in 1985 by NO_x NP elimination policy. And DGP do not increase for 40 years from 1980.

If we use these all NO_x 2.4×10^9 t, we can fix CO₂ 5×10^{10} t ($25 \times 2.4 \times 10^9$ t) this amount is almost same as 4.4×10^{10} t (CO₂ produced in 2010). We can protect global warming by promotion of CO₂ assimilation by using NO_x.

5 Rice and wheat plantation to increase CO₂fix

One hector rice field produce 6 tone rice fixing $3 \times 6 = 18$ tone CO₂.

There is 0.81 million hectare (35 % of culture field) fallow field (kyukoudenn) in Japan. If plant rice at this field, we can produce $6 \times 810000 = 4.86$ million ton rice and we can fix $4.86 \times 3 = 14.58$ million tone CO₂ If we plant rice and wheat, we can get 9.72 million ton grain and we can fix 30 million tone CO₂

If we plant rice at all rice field $1.46 + 0.81 = 2.27$ million hectare, we can get $6 \times 2.27 = 13.62$ million tone grain will be obtained. and $13.62 \times 3 = 40.86$ million tone CO₂ will be fixed, In the process of rice production 27 million tone straw is also obtained. This straw is good food for cow. Livestock industry is also promoted then this gives great contribution for protection of global warming and for regional revitalization.

6 Heat Balance. Heat absorption by CO₂ assimilation is essential for protection of global warming (51)

On earth 14 billion tone fossil fuel is burned and CO₂ 3.6×10^{10} t was produced. And 7.4×10^{15} kcal is produced. When we consider the heat produced by animal respiration, 7.4×10^{15} kcal $\times 4.6/3.6 = 9.45 \times 10^{15}$ kcal is produced. (24)

The earth is also warmed by the heat of atomic energy. Uranium produce 2×10^{15} kcal heat. Electricity generation capacity of the world is 16868 Tetra watt h. Electricity generation by atomic energy is 2086 Tetra watt h. Therefore $7.4 \times 10^{15} \times 2986 / 10868 = 2.02 \times 10^{15}$ kcal evolved by atomic energy.

The earth is also warmed by the heat evolved by animal. Human being eat 1000 kcal food every day and release heat 1000 kcal every day. Population of the world is 7.6 billion. Therefore human being is releasing $1000 \times 365 \times 76 \times 10^8 = 2.8 \times 10^{15}$ kcal in one year. Animal other than human being, caw, bird, whales, seal are producing heat. We can estimate as same as human being 2.8×10^{15} kcal.

Fossil burning produce 7.4×10^{15} kcal, atomic energy produce 2.02×10^{15} kcal. Human being produce 2.8×10^{15} kcal. Other animal produce 2.8×10^{15} kcal. Total heat emission is $(7.4 + 2.02 + 2.8 + 2.8) \times 10^{15}$ kcal = 15.02×10^{15} kcal

CO₂ assimilation must be promoted by stopping of NO_x elimination and by stopping waste water purification. By stopping NO_x elimination. 1.44 billion Tone NO_x can fix $1.44 \times 25 = 36$ billion tone CO₂. Amount of N.P in drainage is around 1 billion tone. By using this 1 billion tone N.P, we can fix $1.0 \times 25 = 25$ billion tone CO₂. By adding $36 + 25 = 61$ billion tone CO₂ can be fixed. And we can absorb 15×10^{15} kcal. And earth can be cooled down.

But developed countries are eliminating 0.6 billion tone NO_x and 0.4 billion tone NP, $(0.6+0.4) \times 25 = 25$ billion tone CO₂ is not fixed. CO₂ increased. And $15 \times (1/14.4) \times 1015\text{kcal}$ is remains and giving hot earth.

7 Conclusion

Global warming is caused by scare of nitrogen and phosphorous by the elimination of NO_x and NP. If developed countries stop NO_x, np elimination, CO₂ assimilation is activated and CO₂ fix and food production will increase, and global warming will stop and national wealth and DGP will increase.

Compliance with ethical standards

Acknowledgments

I wish to acknowledge Late Dr Okazaki Minoru. He was my most intimate friend since 1947. He developed the methods to make clean water and clean air. He gave me precious informations to write papers. I also acknowledge the editors of New Food Industry [ref 1], Eur J Exp Biol [ref 7], International J of Waste Resources [ref 16.19], International J of Earth Sciences and Biology [ref 29] who advised me to write papers without asking any publication fees..

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