The IPAT Equation is Explained After Petra FYI

Petra builds the "structural shell" that comprises all exterior walls, interior load bearing walls, floors, roofs, stairs and exterior decks. Petra's system replaces all structural studs, floor joists and plywood, structural roofing members including plywood/OSB, roofing materials (shingles, etc.), exterior sheathing, vapor wraps, insulation, sheetrock, roofing, gutters, door and window casing, HVAC ducting, and has other component advantages. Petra can build almost everything the conventional construction materials and systems build.

One of the major advantages above all the obvious lifetime warranty benefits is now the worldwide carbon tax initiative. A 2,400 square foot wood frame house requires destroying 30+ trees and 3+ acres of eco-system forest. So annually one new home eliminates 30 tons of fresh oxygen and prevents 35 tons of CO2 from being consumed by the harvested trees. Considering that it takes 30+ years for the forest to grow back to maturity, using a conservative 20 years means that every Heart Craft house built in that time period allows a minimum 600 tons of fresh oxygen to be produced and 700 tons of CO2 to be removed from the atmosphere. Currently 1,000,000 homes are built annually in the United States. If all of these were Heart Craft homes, 600 million tons of oxygen would be produced and 700 million tons of CO2 would be removed from the atmosphere. Petra will be better than Tesla and Solar City combined by transforming the largest creators of global warming upstream CO2 into positive influences as largest reducers of global warming and stewards of conservation and waste reduction when they become allies investing in Petra factories and hiring US citizens instead of China, etc., destroying world's virgin forests and importing products so further ruining our economy. The growing world population is harvesting more trees than can be grown to provide affordable housing.

The Carbon Tax credit per bills in congress is anticipated to be \$25 per ton in 2018 so when Heart Craft reaches goal of "20% market share in 2020", just 20% of 1M new homes annually is 200,000 homes. The tax credits for Heart Craft having the lowest carbon footprint and uniquely saving three acres of ecosystem trees for each 2,400Ft2 house is exponential: 20 years of tax credits of 30 tons CO2 x \$25 per ton = \$750, then x just steady 200,000 homes = $150,000,000 tax credits! 2nd year: $300M, 3rd $450M…6th $1B - serious money to entice large competitors to become allies by diversifying portfolio and earn better margins investing in factories.

Goal 20% of USA market by 2020: Construction Wood/Steel Industry 2015: $34B • Insulation market 2019: $10.3B • Sheetrock Industry: $50B • Roofing Industry: $21.4B • Exterior Vapor Barrier Industry 2016: $2B • Exterior Siding Industry 2018: $12.1B • Flood Damage: $3.5B • Fire Rebuilds 2014: $9.8B • Carbon Tax Credits $1B • Petra's LEEDPlatinum.com website is $10+M selling certified products. Insurance companies will mandate Petra • Government "sole source contract" Petra • architects specify • End Users demand Petra.

The Sustainable Scale Project

http://www.sustainablescale.org/ConceptualFramework/UnderstandingScale/MeasuringScale/TheIPATEquation.aspx

What is the IPAT Equation, or I = P X A X T?

One of the earliest attempts to describe the role of multiple factors in determining environmental degradation was the IPAT equation[1]. It describes the multiplicative contribution of population (P), affluence (A) and technology (T) to environmental impact (I). Environmental impact (I) may be expressed in terms of resource depletion or waste accumulation; population (P) refers to the size of the human population; affluence (A) refers to the level of consumption by that population; and technology (T) refers to the processes used to obtain resources and transform them into useful goods and wastes. The formula was originally used to emphasize the contribution of a growing global population on the environment, at a time when world population was roughly half of what it is now. It continues to be used with reference to population policy.

New Insights

In addition to highlighting the contribution of population to environmental problems, IPAT made two other significant contributions. It drew attention to the fact that environmental problems involved more than pollution, and that they were driven by multiple factors acting together to produce a compounding effect. Subsequent research using IPAT indicates that the assumption of a simple multiplicative relationship among the main factors generally does not hold – doubling population, for example, does not necessarily lead to a doubling of impact. Approaches which allow for different weighting to be assigned to each factor have been more successful in accounting for impact[2].

Attempts to strengthen the predictive power of the equation have been made in terms of incorporating a variety of social, political and technical factors[3]. Some of these studies[4] enhance the equation's usefulness for policy development by indicating the variable contribution of different factors, who is responsible for various factors and therefore where resources might best be directed to reduce impact most effectively. However, making the formula more complex also makes it more difficult to apply.

Limitations

To date, IPAT applications have been limited to evaluation of a single variable measure of environmental impact, such as air pollution. For example, the Intergovernmental Panel on Climate Change has applied IPAT to studies of CO_2 levels[5]. The equation is helpful, to a limited extent, in assessing the contribution of different PAT factors to greenhouse gas (GHG) emissions. The report suggests that levels of GHG emissions for affluent countries increase with increases in affluence, while both population and level of affluence can be significant factors in GHG emission trends in poorer countries. Various applications have found that different types of impacts (eg whether CO2 or SO2 levels are being considered) relate differently to changes in population, affluence and technology[6].

Relation to Sustainable Scale

From a scale perspective, the IPAT equation does not help us to identify sustainable limits regarding either individual or composite environmental impacts. It does assist in our understanding of the general factors that increase or decrease environmental impact, but not the level of impact that exceeds sustainable scale. However, by highlighting the complex interplay among a variety of factors in creating an impact, the IPAT equation also demonstrates that there are multiple ways of reducing undesirable effects. It has been noted, for example, that different nations might focus on different factors to reduce their overall impact: more affluent countries could contribute most by reducing their level of consumption (A); many poorer countries could contribute most by reducing their population (P); and the former socialist countries could make the greatest contribution by making their technologies more efficient (T). While there is some truth to this observation, it is also true that opportunities exist in most nations to make improvements in all three factors.

In Summary

The IPAT equation made a contribution to understanding the multiple causes of environmental impact, and it continues to be developed as a method for improving our understanding of these issues. It has not helped in identifying sustainable scale, but it is a useful framework to assist in thinking about ways of reducing environmental impacts by reducing various types of throughput.

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