Energy Optimised Settlements – Enabler for Necessary Civilization Targets

Roland Mösl

(Roland Mösl, Planetary Engineering Group Earth, St. Leonhard near Salzburg, AT, founder@pege.org)

1 ABSTRACT

"Net-zero-emission and all will be good again" is scientific not holdable. We need to target far beyond towards planet renovation back to 350 ppm CO_2. This requires worldwide wealth. Worldwide wealth is only possible with great cost reductions for renewable energy and housing. Energy optimized settlements target this by synergy and cost optimized construction methods.

"Net-zero-emission and all will be good again": 2021 changed the balance of the Amazonas to more GHG emission than absorption. 2023 absorbed the land nearly no CO_2. Time to reevaluate our strategies to deal with the climate change.

350 ppm CO_2 is considered a stable climate situation, so we have to target reducing CO_2 until we are back to 350 ppm CO_2. We call this planet renovation. It requires about 47,000 TWh electricity to filter 1 ppm out of the atmosphere and split it into carbon and oxygen.

Reducing the CO_2 level in the atmosphere is complete different from reducing CO_2 emissions and requires complete different strategies.

The current strategy for reducing CO_2 emissions is increasing energy prices, promoting reduce, restrict, renounce, stopping everything what could grow fast, holding great parts of humanity in poverty. This causes social unrest and strengthen the climate change deniers.

The planet renovation strategy requires cheap renewable energy and the whole mankind to contribute. This means worldwide wealth and is the opposite of the current strategy.

When 10 billion people contribute an average of 10,000 kWh/a we can reduce CO_2 by 2 ppm per year. Hope that this is enough. GHG emissions from unfreezing permafrost could require even more.

The GEMINI next Generation house and the energy optimized settlements targets to make renewable energy and housing cheap enough to enable worldwide wealth and the planet renovation.

Keywords: climate change, planet renovation, 350 ppm CO_2, cheap energy, worldwide wealth.

2 INTRODUCTION

The concept of using the same space twice for cost and land use reduction started 1991 with the project "GEMINI inhabited solar power plant". The book "Aufstieg zum Solarzeitaler" (Advance to solar age) published 1993 was about this project.

Only one "GEMINI inhabited solar power plant" was built in Weiz as the main attraction of the Styria country exhibition about energy in 2001. Unfortunately, the prototype was reduced from an annual yield of 30,000 kWh to just 8,500 kWh.

The project “cheap housing” 2018 evolved 2019 into the project “GEMINI next Generation”.

3 ENERGY TRANSITION BY CHEAP HOUSING

Everybody needs housing. So how to combine this existential necessity with as much energy production as possible? How much energy could a house produce? How much energy could a settlement produce?

A conventional settlement of one family houses could be about 14 per hectare. Even with 20 kW peak photovoltaic per house, only 280 kW peak.

An energy optimized settlement has 1,200 kW peak photovoltaic per hectare, more than 4-times more than a conventional settlement.

In addition to all the photovoltaic, only central power to methane systems, underground gas storage and CCPP are necessary. Germany already has 25 km³ underground gas storage.

4 LAND FOR ENERGY

There are countries with extreme high prices for building ground. There is this building ground for 1,000 €/m² unaffordable and some meters away is this photovoltaic in the field. People question, why here 1,000 €/m² and there only 10 €/m².

This can and will cause social unrest. Also, the cost of the energy transition. Renewable energy is cheaper than fossil energy, only problem to have to pay it for the next 20 years upfront.

A solution can be, that the government purchases green land and changes it to building land, but only to lease, and the lease price has to be paid in electricity feed in according to demand into the grid.

For example, Germany has 26,000 km² only for energy plants. Only 10,000 km² energy optimized settlements would be 1,200 GW peak photovoltaic, 3,600 GWh batteries, 1,200 TWh/a yield 16 million houses. 16,000 km² more for nature instead of 100% human usage for energy plants.

If all this were “Land for Energy” areas and the lease would be 60 kWh/m²/a, the government would have 600 TWh/a lease.

This lease could be used for cheap electricity for the industry to avoid that the industry is leaving the country.

5 RECYCLING BY ENERGY INSTEAD OF BIOLOGY

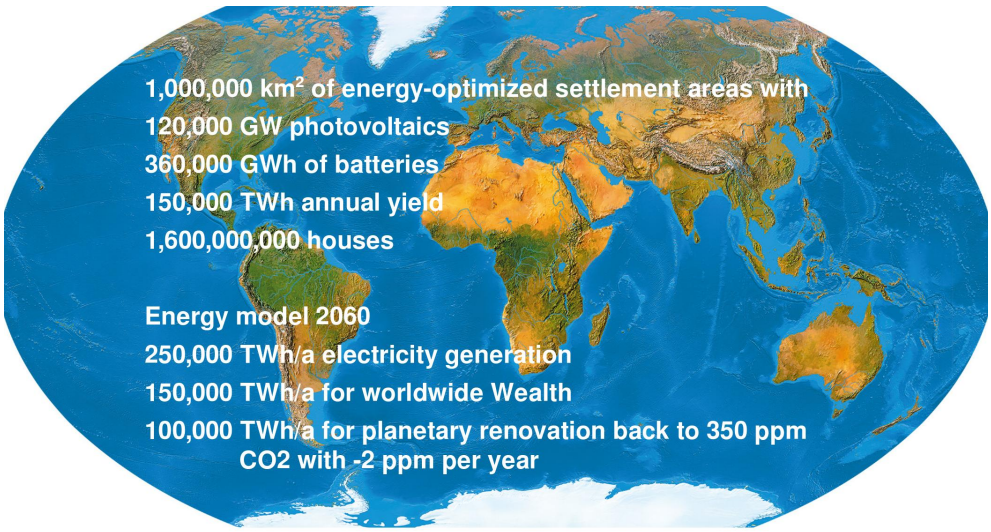
The current idea of a sustainable circle economy is based on the biological recycling. But this concept is very limited, as the Earth overshot day and the spell "We need 2 planets" shows.

Austria has much wood, but we think international. Building with wood in areas where even collecting firewood for cooking is a major problem? There is about 50 times more iron than carbon in the Earth's crust.

Having enough energy means far more recycling is possible. The first huge recycling will be the recycling of the CO_2 in the atmosphere until we reach again 350 ppm CO_2.

The longer a civilization exists, the more perfect recycling must become. Maybe we will throw in the future an old smartphone into a gas centrifuge to recycle all the materials by investing 500 kWh of electricity into this action.

So we think PU-steel composite and a steel frame is more sustainable than a wooden construction. The energy from one square meter photovoltaic can recycle more steel and PU than 10 square meter of forest can recycle wood.



6 FAST CHARGING AT EACH SETTLEMENT

The houses will be mainly DC oriented, with about 3 kWh batteries per kW peak photovoltaic. So demand oriented grid feed in is possible. But this also enables fast charging. When one hectare of settlement has 3.6 MWh batteries, even fast charging of trucks is possible.

The inhabitants can offer fast charging at lower costs as usual. Much more fast charging stations with a lower price could accelerate the change to electric mobility.

7 TARGETS FOR 2060

Humanity will succeed if it does not allow itself to be stopped. From 30,000 TWh/a to 250,000 TWh/a in 35 years, only 6.2 % more electricity production per year is required. The raw materials for this are available in abundance: Silicon for photovoltaics and sodium for batteries.

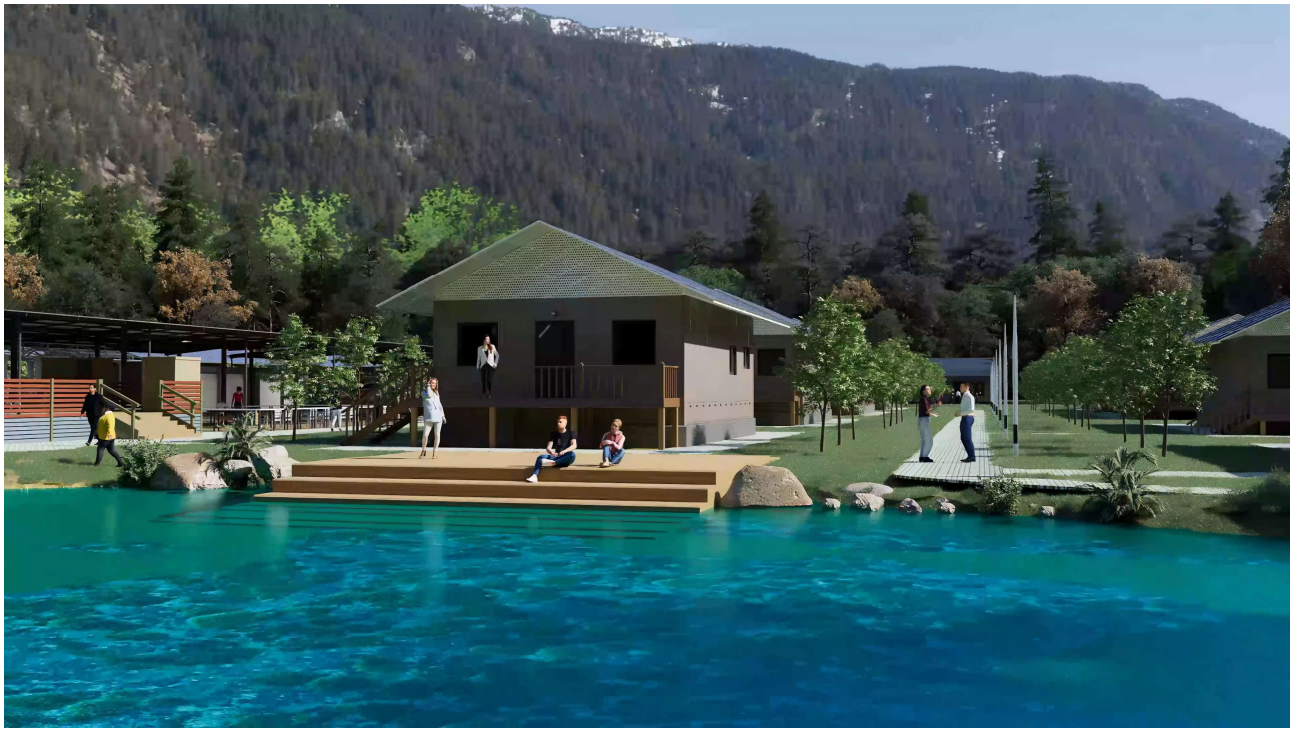
Worldwide wealth and a limitless future are possible if we overcome the destructive mindset of limitism. Previous attempts to fend off limitism have led to unsustainable ideas such as "perpetual oil" and "let's carry on as before", which we must also overcome.

8 CONCLUSION

The climate protection movement is in a sever crisis. A reinvention of the entire climate protection movement is essential. We cannot leave it to fossil energy fans to shape our future.

Previous approaches must be reviewed in terms of their feasibility and effectiveness against climate change.

The GEMINI next generation project with energy-optimized residential areas has the scope to be a very significant part of the energy transition and climate protection and, by contributing to planetary renovation back to 350 ppm CO2, is also pursuing much more efficient goals to get climate change under control.



Let's imagine an opinion poll in a 10-storey apartment block in a poor neighborhood. Very likely that a majority here votes for climate change denier parties. What would you be willing to do for climate protection? Then there is a list of the usual demands and finally a photo of an energy-optimized residential area. Would you be willing to move into your own home in such an area to protect the climate? Sure, if I could afford it! Rent plus running costs plus electricity plus fuel for the car is more expensive than the loan installment minus the proceeds from the sale of electricity, you would have more money left over. Imagine what the answer will be.

9 REFERENCES

Roland Mösl: Aufstieg zum Solarzeitalter (Advance to solar age), Salzburg 1993
Danny Chivers: The No-nonsense Guide to Climate Change, 2010
Roland Mösl: Calculation ERROR, Salzburg 2013
Man Xie, Feng Wu, Yongxin Huang: Sodium-Ion Batteries: Advanced Technology and Applications, 2022
Hoda Shokrollahzadeh Behbahani, Matthew D. Green: Direct Air Capture of CO2, 2023