Centre for Economy Research of Renewable Energy and Distribution Systems

Transformation towards sustainable society

Crises on financial markets and public debt as top of the transformation process with value change

Transformation of the administrative building into nearly zero energy building

Transformation of energy market

Transformation of pension system

Conclusion and main findings

Review of Agenda K4I Summit September 2013

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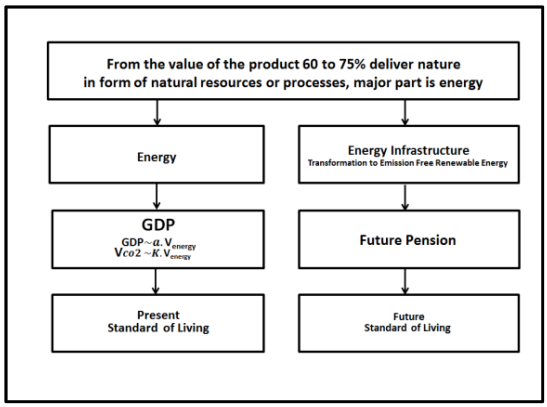
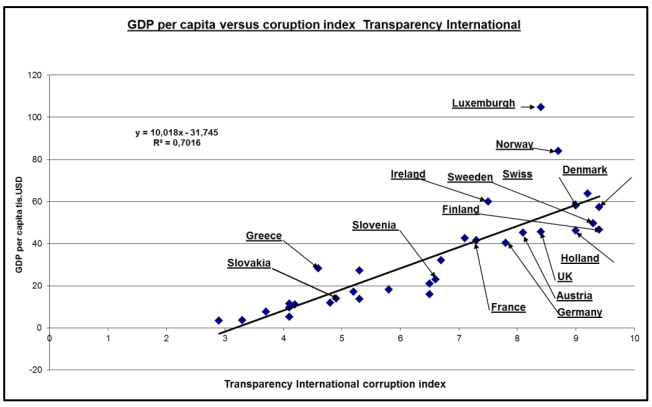
Management summary

The main challenge and objective of all policy makers both on EU and on Member state level is a sustainable society. Our study conducted on level of Slovak Republic shows 3 core interrelated components which achieve this objective:

1. *Practical experiment transforming administrative building into net zero energy building shows that proper selection of technologies allows transformation without subsides. 87% reduction of primary energies and 96% reduction of carbon emission have been achieved comparing to the year 1996. The limit of the transformation lies in energy market organisation which creates economic barriers and prevents competition and possibility to supply renewable energy to the market.*
2. *Study of energy market shows importance of social cost of carbon emission which used in the form of green credits and consumption tax in dynamic interrelation could create driving force for transformation of the market and in the same time stable market environment suitable for long term investment. The study shows interrelation between energy, carbon emissions and GDP and between energy technologies and future pensions.*
3. *Observed facts from 10 years long transformation of the PAYG social security system in Slovakia into I. and II. Pillar indicates that new distribution of role between state and private sector is needed for pension reforms. This will solve inequality between insures and remove conflict of interest between asset and account management creating at present extra cost and squeezing down the future pensions. Individual accounts create the base for new arrangement of intergeneration transfers within the three generation family and could solve the free ride problem and large family disintegration.*





All studies showed that corruption creates the basic limit for the transformation society based on innovation. Removing 10% of the corruption measured by perception index of Transparency International nearly doubles GDP per capita within the EU states.

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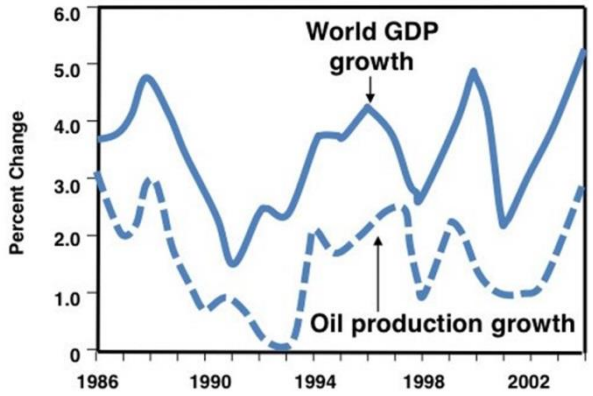
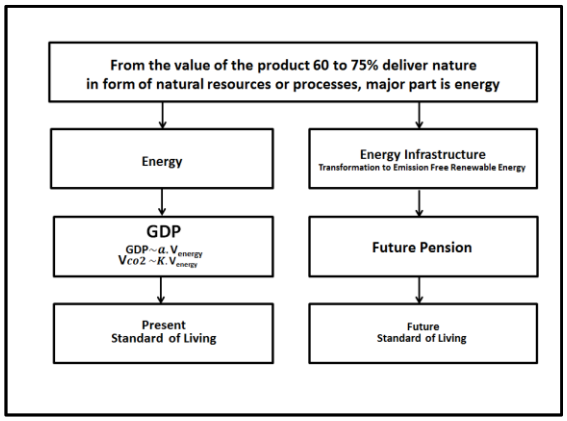
Crises on financial markets and public debt as top of the transformation process with value change

Psychology model of existential crises has been applied on economy process started 1995. Analysis shows that the processes fulfill criteria of the transformation process connected with change of values. Following main economy crises have been identified:

- Crisis of technologies suitable for effective energy conversion known as energy crisis
- Crises of ecological systems
- Crises of PAYG pension system

Analysis shows key role of the energy for the GDP and hence the same key role play energy infrastructure and conversion technologies for pension system in modern society.





Sequences of cyclical crises with crashes on different markets started in 1995 have following common features:

1. Shows asymmetry in information on markets
2. Shows developed moral hazards for consumers as consequence of failures of governments and regulators to set up and regulate markets
3. Shows the dynamics on markets which could be successfully described as interlinked behavior of people through chaos theory. This very modern approach to economy problems completely change basic assumption – agents are not any more independent in their rational decisions rather influenced by each other
4. Changes on financial market started in 1995, crash on Nasdaq in 2000, transformation of price management of the crude oil from production markets to financial markets between years 2001 to 2006, crash on real estate market with the peak in July 2006, crash on energy market in July 2008 developed into the economy crisis and peaking in September of the 2008 on financial markets. This sequence of events together with the content of each period fulfills exactly the existence crisis model developed by psychology.
5. On the top of existence crisis the old values are breaking and new set of values and new order of the values are set up. Long term transformation process underlays cycling crises and introduce gradually new set of values.
6. IT technology solved the energy crisis of 70ties last century. The nature resources and energy consumption in average product went down to 50%. 15 years were needed to solve energy crises of 70ties.
7. Energy crises and ecology crises could be solved in the same 15 years' time period. The least cost of transformation can be achieved if transformation cost of energy market towards renewable energy is measured via carbon emission and social cost of carbon is embedded into market in form of green credits as an incentive stimulus and consumer tax as vehicle for money collection and penalty instrument. The transformation cost could be applied on the

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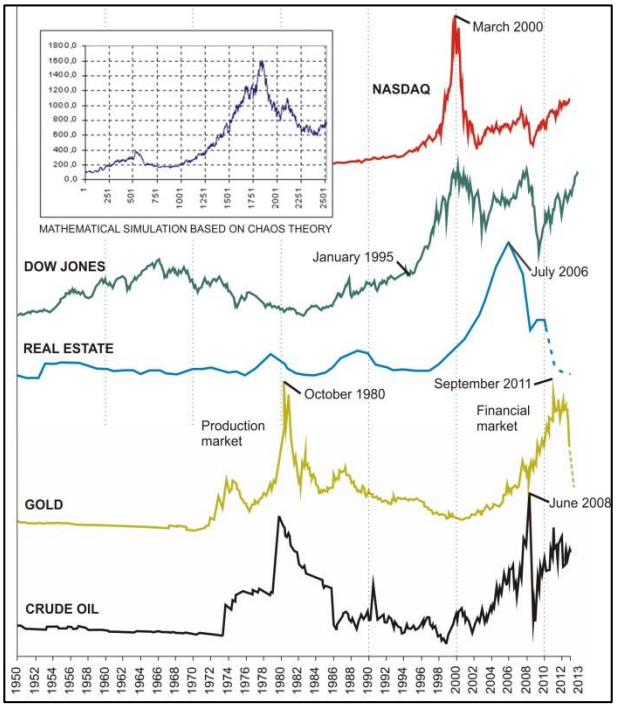
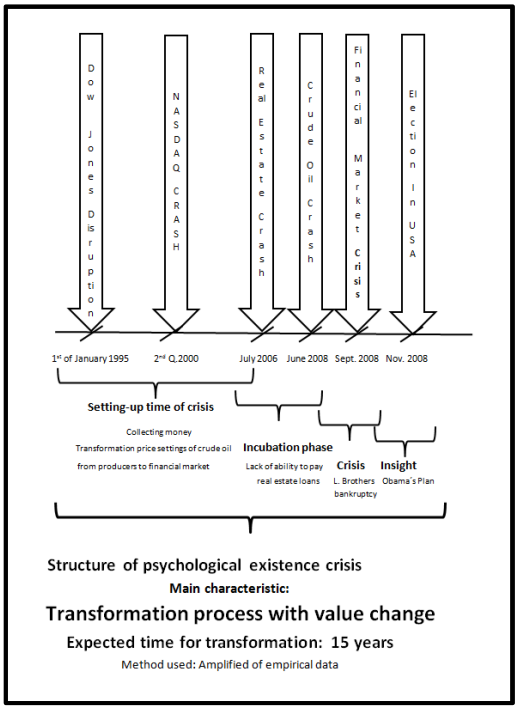
whole market directly or restricted to energy market. This political decision in the same time decides about the way how the consumption tax is constructed.

8. Since energy supply is accompanied by carbon emission the dynamics of carbon emission is also the same.
9. Eco systems do not reproduce the waste produced in human economy processes anymore. The main problem has been identified by science that carbon emission are responsible for about 50% of the problem
10. Dynamic interrelation between energy and GDP not only determines the economy activity and standard of living measured by GDP, but also volume of carbon emission produced. ***This relation shows importance of energy companies in form of assets for pension systems.***





Transformation to the sustainable society means transformation of the energy sector to using renewable energy without producing carbon emission with the least investment spending policy and in the same time transforming PAYG pension system in order to:

- solve free rider problem within PAYG system,
- splitting risk equally between yields from labor and yields from asset in PAYG system
- keeping social solidarity as main economy advantage in order to keep the cost of labor competitive
- our main findings are:
  1. social value of the carbon emission seems to be the determining economic value which could be used as a main drive force transforming society towards renewable era. The value of the carbon emissions could be adjusted to the society need and their actual possibilities
  2. transformation from the competitive energy market to cooperation competitive markets seems to be the determining factor for market organization to achieve less possible resource spending
  3. new role between state and private sector for asset management and market organization in pension system should be settled down

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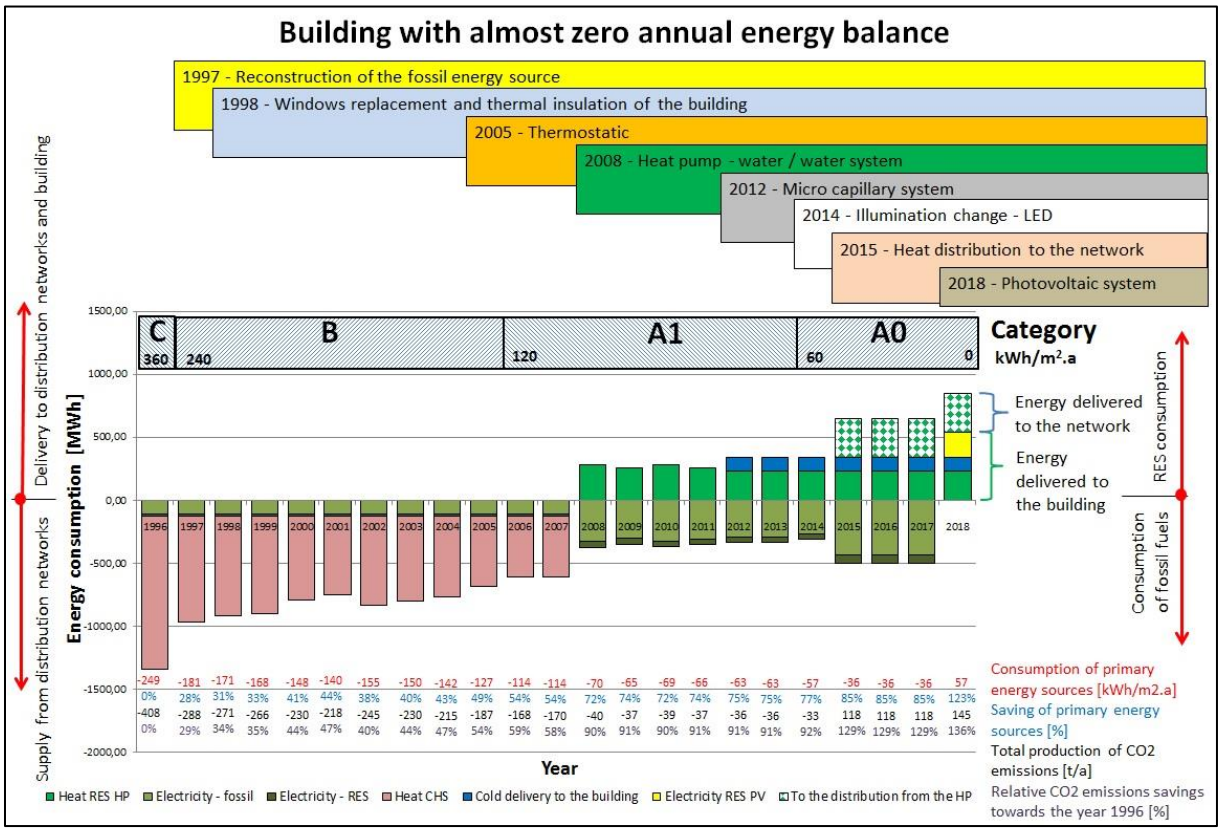
Case study 1.

Transformation of the administrative building into nearly zero energy building without subsides



The heat and cold in administrative building with the 5 400 m area have been transformed into renewables energy source.

Key findings:

- technology applied allows savings measured since 1996:
  - 73% of the heat
  - 87% of the primary energy sources
  - 96% of the carbon emission produced

The transformation of the building includes building renewable energy source and related technology on site in order to response to energy crisis and climate change. This changes the building from the pure energy consumer status into source of energy. In the same time is solving also quality of inner climate during summer using irradiation as the main energy transport principle. This solves problems with heat waves which dramatically raises probability of human collapse up to 33%. From the economy point of view the transformation of the building has been done only from the income of the market. No subsidies of any form have been used till now. Key problem which limits the transformation into net zero energy building is providing indiscriminative access of the local energy

source on the energy market. This needs to change principles of energy market organization in order to achieve net zero energy balance of the building.

Case study 2.
Transformation of the energy market

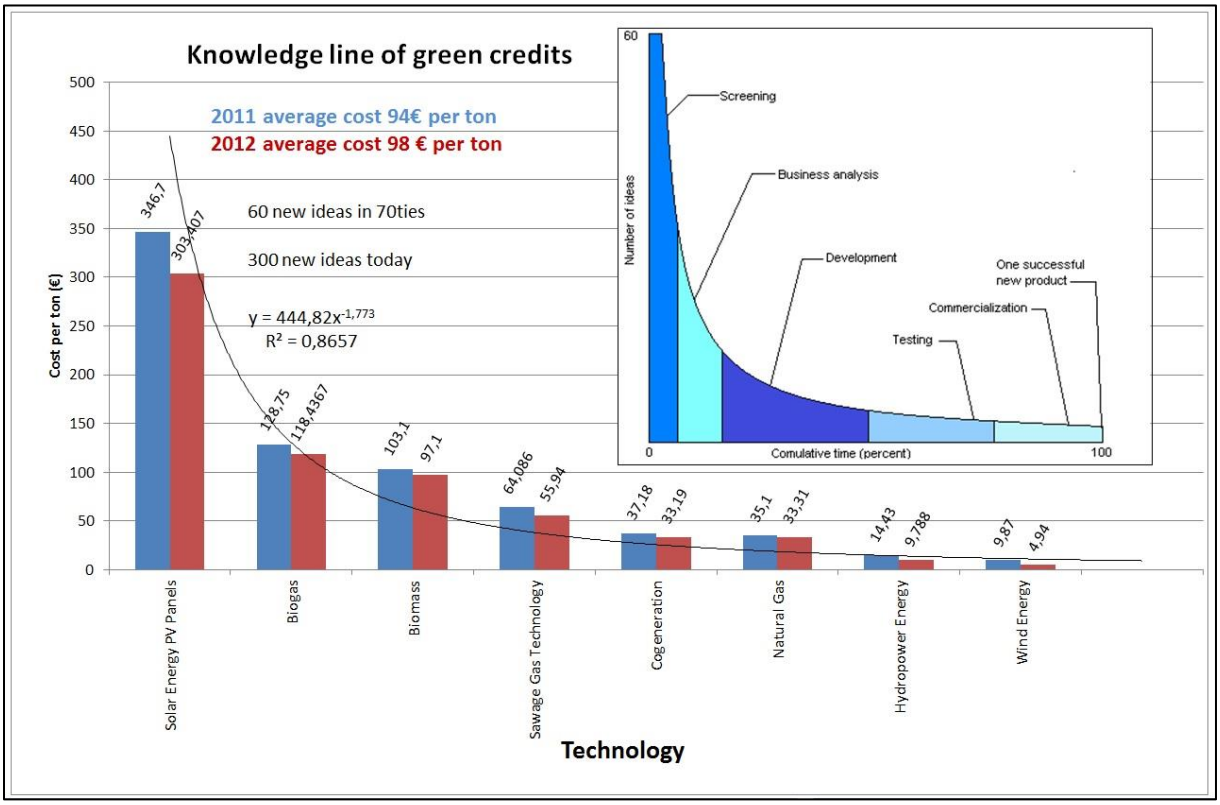
Transformation of the energy market towards renewables has been studied. The social cost of carbon emission has been recalculated from subsides known as feed in tariff. We have obtained in average 94€ extra subsides over market price paid in order to supply energy without 1 ton carbon emission in the year 2011 and 98€ per ton in the year 2012 respectively. The knowledge line of cost of carbons for different technologies used has been constructed which spans from 10€ till 346 € per ton for different technologies.

Study of using financial principle based on the feed in tariff distributed as mandatory payment of consumers' shows:

- *the application of feed in tariff transfer risk from investor to consumer and do not creates the effective press on cost, it has negative impact on the energy market,*
- *destroy investment effectiveness allocation*
- *introduce economy redistribution processes between investors through markets of heat, electricity and carbon emission which highly influence competition*
- *create economy barriers for entry to market comparable to market price*
- *create incentives for raising the cost and hence consumer prices EU has 30 to 40% energy prices higher than USA and China – this way destroy competition of EU*
- *change distribution of resources through the society acting as consumption tax which burden social system, hence shifting large part of the society towards so called energy poverty*
- *study of European Court of Justice judgment PreussenElektra AG v Schhleswag AG [2001] EUECJ C-379/98 shows that no expert or scientific opinion has been considered rather formal and political decision has been made:*
    - *no real influence of the feed in tariff principle applied to the market has been considered rather the decision is based on formal arguments. The argument says that subsides are no state resources hence arrangement of feed in tariff do not damage article 87 of the Treaty*
    - *because the arrangement of feed in tariff is useful for protecting the environment and reduce the emissions of greenhouse gasses the political decision prevails over content of Article 28 Treaty*
- *spreading out the feed in tariff principle through energy market introduced many corruption practice known from media and is one of the reason why price of the energy raised up to 30 to 40% higher comparing to prices in USA or Asia as has been discussed in May premier´s summit.*
- *There was no real reason for subsiding technologies through market which do not fulfill selection criteria of the knowledge line, rather direct state support of research and development is strongly needed*
- *as example of the result of this practice means yearly payment of 18 billion € in Germany, 1,7 billion € in Czech Republic, 0,4 billion € in Slovakia etc. This costs each citizen in these countries from 71 to 218 € per year and negatively influence the investment and consumer market*

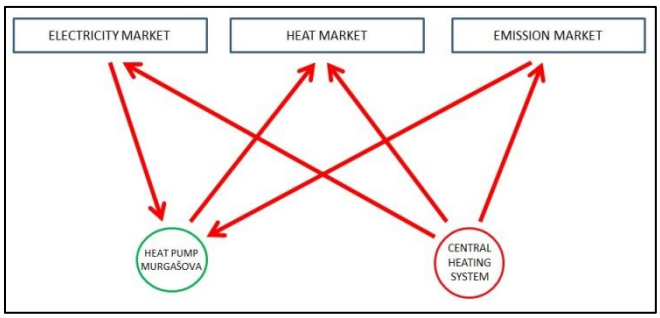
The transformation of the energy market is also transformation from few power stations with large energy power into many energy sources with low energy power. The reason of local renewable energy sources lies in fact that they should be consumed directly on site. Therefore the construction of large renewable energy power stations of site means in many cases waste of

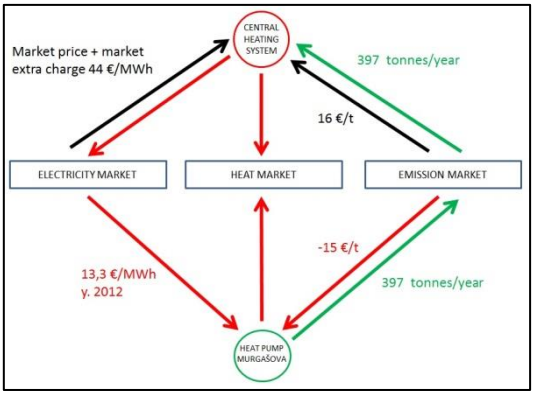
the valuable investment resources without bringing real value. Transformation cost measured and valued via carbon emission allows construct transformation as a process *which will*



introduce real competition on the market between investors. Value of carbon emission:

1. *acts as incentive fee in form of green credit selects effectively between different technologies.*
2. *creates the economy force which squeezes down the cost and the price of the energy*
3. *introducing as part of the price and cost it create the condition for indiscriminative access of the both fossil and renewable energy resources if the qualitative conditions are met*





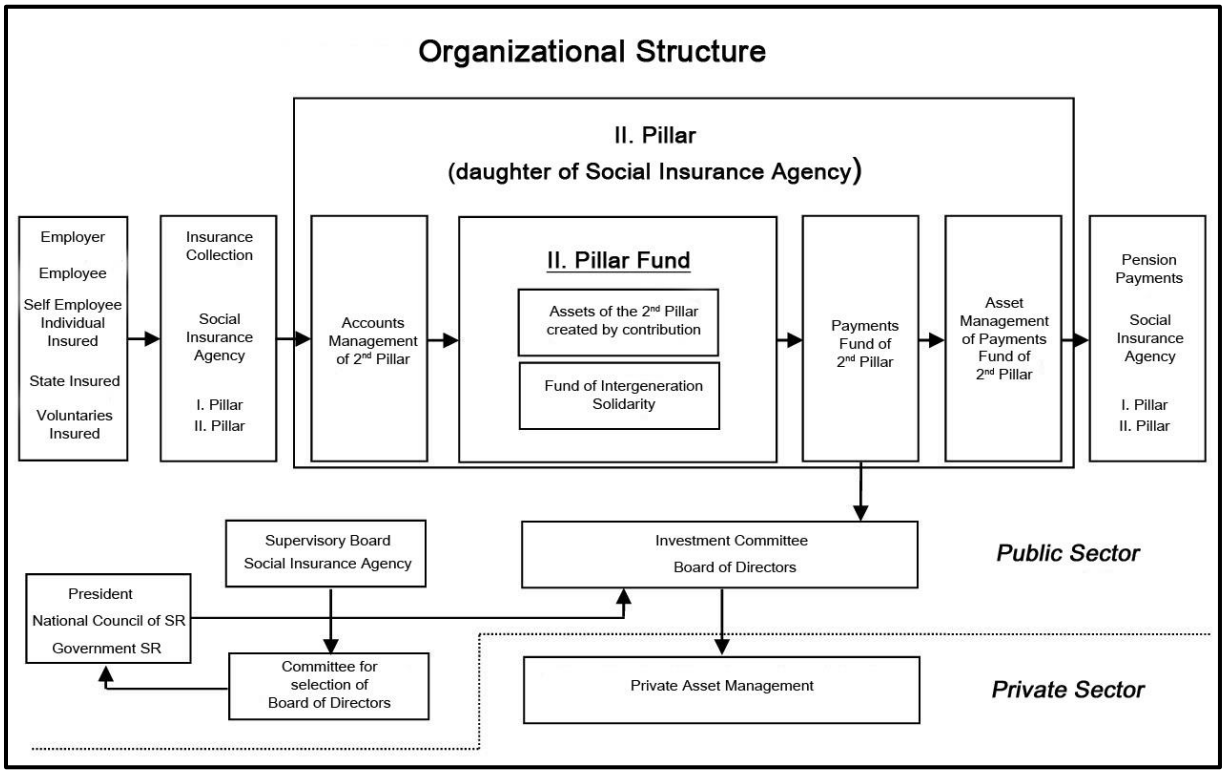
The study shows the important role of the value of the social cost of carbons as transaction cost, which could be measured and charged. Proper use of this tool in form of green credits as incentives for renewables and consumer tax for fossils ***in mutual dynamic relation could be used for regulator as general instrument for market regulation according state of the economy and their needs***. No other subsidies are needed in form of feed in tariff for transformation of the energy market. There are only two products on the energy market. The first one is energy itself and the second is ability to

supply energy from renewable sources without carbon emission. Suggested solution: The energy market constructed as cooperation concurrency market with nondiscriminatory access to the market for both fossil and renewable energy sources with embedded social cost of carbon in terms of green certificate on incentive side and consumption tax burden on fossil energy, transform market towards renewables. ***Research and development of the new technology should be financed from public money in form of general tax.***

Case study 3.
Transformation of the pension system

Analysis of pension system shows importance to solve key problems as:

- free rider problem,
- baby boom problem,
- proper risk splitting between two different sources of the pension - asset and work force respectively
- splitting asset and account management between two different bodies will solve introduced problem of equality of insurers and conflict of interest



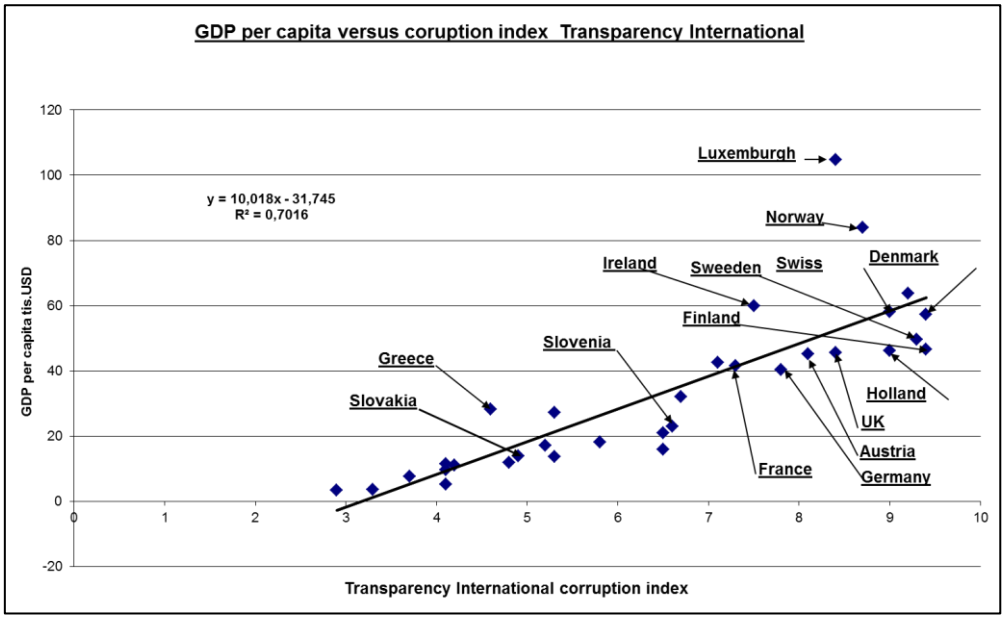
1. The suggested solution keeps social solidarity with redistribution from 3:1 during accumulation phase to 2:1 during retirement phase as key economy factor which keeps down the cost of labor.
2. Free ride problem could be solved introducing individual accounts.
3. Baby boom problem needs accumulate enough resources in order to create financial reserves and cover and guarantee the future pensions.

4. Both, yield of labor and yield of asset in 40 years interval is nearly the same between 2% to 3% a year. The risk should be equally splitting between income from labor and asset, respectively.
5. General model of the mandatory two pillar system and voluntary state supported third pillar has been constructed. Transformation from PAYG system will take 40 years
6. Analysis shows that in mandatory system there is competition on asset market but there is no competition between accounts.
7. Economies of size favor management of accounts in Social Insurance Agency.
8. Competition principle suggests that private sector manage the asset.
9. General model contain effective regulatory and control instruments for state.
10. Private sector should manage the asset and compete on market.
11. State should put on individual accounts the same level of guarantee as in PAYG system. So called intergeneration pension fund has been constructed as heart of the 2nd Pillar. Shares of state owned companies like those from energy sector or other infrastructure could be used effectively as asset of this fund.
12. Freedom of movement of the work force through the labor market EU is solved within this this model as well.
13. Transferring accounts within the public finance solve also problem connected to public depth.

Concluding remarks

1. Analysis of the different factors shows that in the energy sector (including transformation of the buildings) there is no stable investment environment allows predictable long term investment.
2. The present market construction allows conflict of interest and is highly influenced by lobbying.
3. The analysis of each market shows presence of the asymmetry in information which creates moral hazard for consumers combined with negative stimulus for investors.
4. Feed in tariff principle negatively stimulates energy market and destroy stability of investment environment on energy market.
5. The volatility on carbon emission market shows that rather condition for speculation as serious investment into renewable energies has been created.
6. The social cost of carbon emission has been calculated 94 €/t and 98€/t in the year 2011 and 2012, respectively in order to produce one green credit
7. Price on the market is only around 5 € or less. Where is the reason for the investment?
8. The subtle border between lobbying and corruption has not been solved which shows the Transparency International perception index of corruption. The chart showing GDP per capita versus TI index indicates that solving 10% of the corruption nearly doubles the GDP per capita within EU states.
9. Price analysis of privatization process of Slovak Gas Industry in the year 2002 and the dividend paid between 2003 and 2012 shows that corruption TI index could be consider to some extend as risk premium.

10. Conflict of interest between asset and account management has been introduced into pension reform in Slovakia. Due to this fact expected loss of 20 to 40% in 40 years horizon has been proved during last 10 years.
11. More effective split of function between public and private sector has been developed.
12. A very simple analysis shows that corruption also influences dramatically the innovation process. If the competition is based on corruption there is no real interest for innovation. It is valid neither for winner nor for those who failed. Simply resources are needed for corruption not for financing innovation. In fair market competition even those who failed will innovate.



Main findings

Transformation to sustainable society based on renewable energy at least possible cost seems to be the answer to present crises. There are three different crises foreseen:

1. *crisis of technologies connected to energy conversion shortly energy crisis*
2. *ecological crisis tight to climate change*
3. *pension crisis in form of baby boom crises and free rider problem*

According to solution of energy crises of 70ties of 20th century 15 years will be needed in order to set up new eco technologies into market delivering enough added values which will:

- *Transform large part of energy market in order to fill expected supply gap of fossil energy and substitute fossil energy to renewable one.*
- *Squeeze down greenhouse emission as main ecological problem.*
- *Shift an organization of the market from pure concurrency market rather to more economically effective cooperation concurrency market.*
- *Social cost of carbon in form of green certificate and consumption tax seems to be universal regulation value which embedded into the market drive the market towards renewable resources based on least possible cost and stimulate innovations based on renewable, nano and bio technologies.*

- *These principles, if applied, will select the least cost technologies and drive the market transition in order to create the stable investment environment which will squeeze down prices of energy.*
- *Transformation of the administrative building to net zero energy building without any subsides have been demonstrates.*
- *Corruption creates limit of growth based on innovation.*
- *Raising bureaucracy does not address the problem of corruption, rather transparent market rules are the answer to this topic.*
- *Comparing the results obtained from energy market to decision of European Court of Justice judgment PreussenElektra AG v Schhleswag AG [2001] EUECJ C-379/98 indicate that no expert or scientific opinion has been considered. Rather formal and political decision has been made. Application principles in form of feed in tariff subsides create large part of economy problems connected with higher price of energy in EU of about 30 to 40% higher compared to those in USA and China.*
- *New distribution of role between state and private sector is needed for pension reforms which will solve inequality between insures and remove conflict of interest between asset and account management creating extra cost and squeezing down the future pensions.*
- *Individual accounts will create the base for new arrangement of intergeneration transfers within the three generation family and will solve the free ride problem.*
- *The key of the transformation process seems to be a human being itself.*
- *Modern psychology is needed in order to solve the puzzle between high standard of living and in the same time low quality of life and vice versa in EU states.*