

2372-29

**Joint ICTP-IAEA Workshop on Sustainable Energy Development: Pathways
and Strategies after Rio+20**

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INDICATORS OF SUSTAINABLE ENERGY DEVELOPMENT

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SOME USEFUL ADDRESSES FOR ENERGY STATISTICS IN IRAN:

<http://www2.tavanir.org.ir/farsi/projects/web-amar-latin/>

<http://pep.moe.org.ir/HomePage.aspx?TabID=9173&Site=pep.moe.org&Lang=fa-IR>

<http://www.amar.org.ir/Default.aspx?tabid=133>

Energy productivity organization:
<http://www.saba.org.ir/en/home>

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- The Concepts of Sustainable Development
- Focus on Local case
- Volatility for Local Energy Development
- Analyzing models

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THE CONCEPTS OF SUSTAINABLE DEVELOPMENT

- Agenda 21, Chapter 35

“Development requires taking long-term perspectives, integrating local and regional effects of global change into the development process, and using the best scientific and traditional knowledge available”.

- Council of Academies of Engineering and Technological Sciences

“It means the balancing of economic, social, environmental and technological consideration, as well as the incorporation of a set of ethical values”.

Source : Naim Hamida Afgan, *Sustainable Energy Tecnology*, Springer, 2008, pp 25-49

- Earth Chapter

“The protection of the environment is essential for human well-being and the enjoyment of fundamental rights, and as such requires the exercise of corresponding fundamental duties”.

- Thomas Jefferson, September 6 1889

“Then I say the Earth belongs to each generation during its course, fully and in its right no generation can contract debts greater than may be paid during the course of its existence”.

Source : Naim Hamida Afgan, *Sustainable Energy Tecnology*, Springer, 2008, pp 25-49

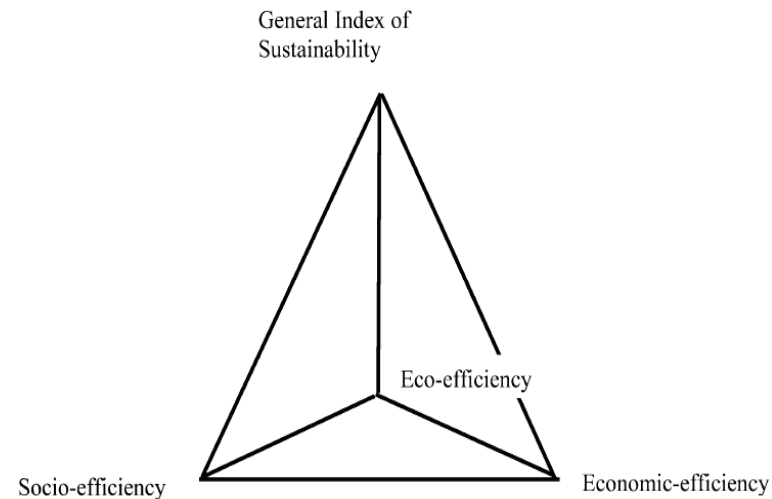
IN COMMON DEFINITION:

- WCED,
Sustainable development is development that meets the needs of the present without compromising the ability of the future generations to meet their own needs
(What are the needs ?)
Basic needs: food, shelter, mobility, health care, education
Luxury needs: entertainment, personal satisfaction and development, etc.

Strategy for **Sustainable development** aims to promote the **harmony** among **human beings** and between **humanity** and **nature**

SUSTAINABLE DEVELOPMENT

- Three pillars (indicators):
 - Economic development (efficiency)
 - Social development (efficiency)
 - Environment protection (efficiency)
- At all levels:
 - Local(National)
 - Regional
 - Global



- Add to that equity, equality in a long time domain

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FOCUS ON LOCAL CASE

BY INTERSECTION BETWEEN THE ABOVE DEFINITIONS , FOR A LOCAL (COUNTRY) CASE WE CAN SAY THAT :

Sustainable Development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations

HENCE, FIRST WE NEED TO FIND ANSWERS OF THE FOLLOWING QUESTIONS FOR A LONG TERM:

- 1- what should be sustained ?
 - what kind of development is preferred ?

- 2- what can be sustained ?
 - what kind of system we can devise ?

For answering the above questions we need solve a complex system (sustainable development system).

Complexity is a multi-criteria indicator that comprises all the individual characteristics of the system

DURING FINDING THE ANSWERS, WE NEED A TOTAL PLAN WHICH IS DEPEND ON THE FOLLOWING PROCESSES:

Local Policy : Process of making important decisions for explicit goals like energy development in a country

Globalization: The contemporary revival of interest in the field of international political economy has coincided with an unprecedented restructuring of the world economy (without obstacle imposed by local).

Democratization: Democracy is the principle of equity of rights, opportunity and treatment, democratization process can be defined within different boundaries including the local, regional and global environment. The intensity of the democratization process is dependent on the number of attributes reflecting the ethnic, religious, cultural and educational

CONTINUED.

Decentralization: Transformation on a large economically system to small systems for making good decision.

- So our plan would be affected of a set processes (policy, globalization, democratization and decentralization) they are immanent to the development of nation also these processes will cover clusters of indicators which are used to describe the state of national sustainable energy development system: economical, environmental and social clusters

THREE INDICATORS OF SUSTAINABLE ENERGY

- Economic
 - Energy is essential to economic and social development and improved quality of life (Agenda 21, chapter 9.9)
- Social
 - To develop for all poverty-stricken areas integrated strategies and programmes of sound and sustainable management of the environment, resource mobilization, poverty eradication and alleviation, employment and income generation (Agenda 21, chapter 3.4)
- Environment (health)
 - All energy sources will need to be used in ways that respect the atmosphere, human health and the environment as a whole (Agenda 21, chapter 9.9)

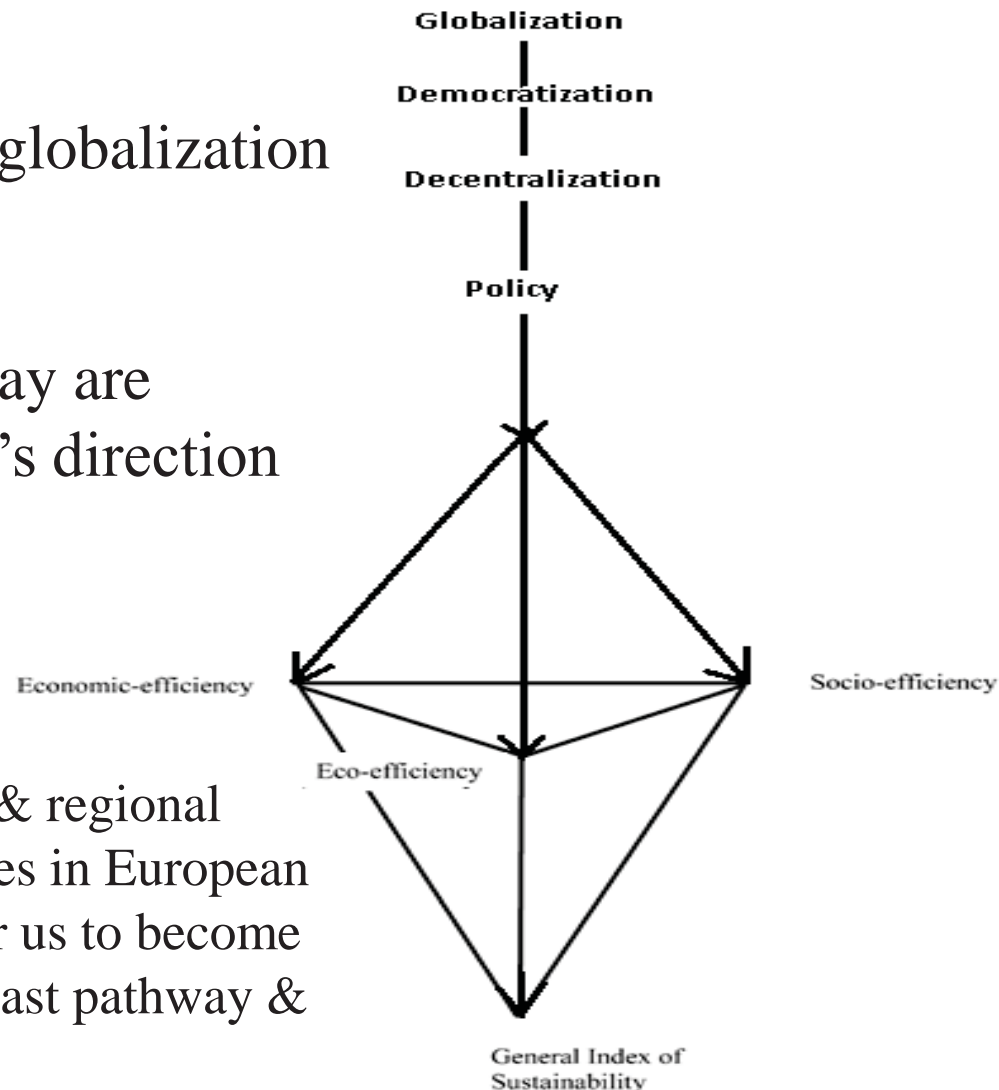
THE BEST CASE FOR NATIONAL SUSTAINABLE DEVELOPMENT

Assumptions :

1-Defined pathway of globalization is in correct direction

2-Democratization & Decentralization pathway are defined in globalization's direction correctly

Some problems in the world & regional economy (like economic crises in European union) can be an evidence for us to become doubtful with respect to the past pathway & direction!!!



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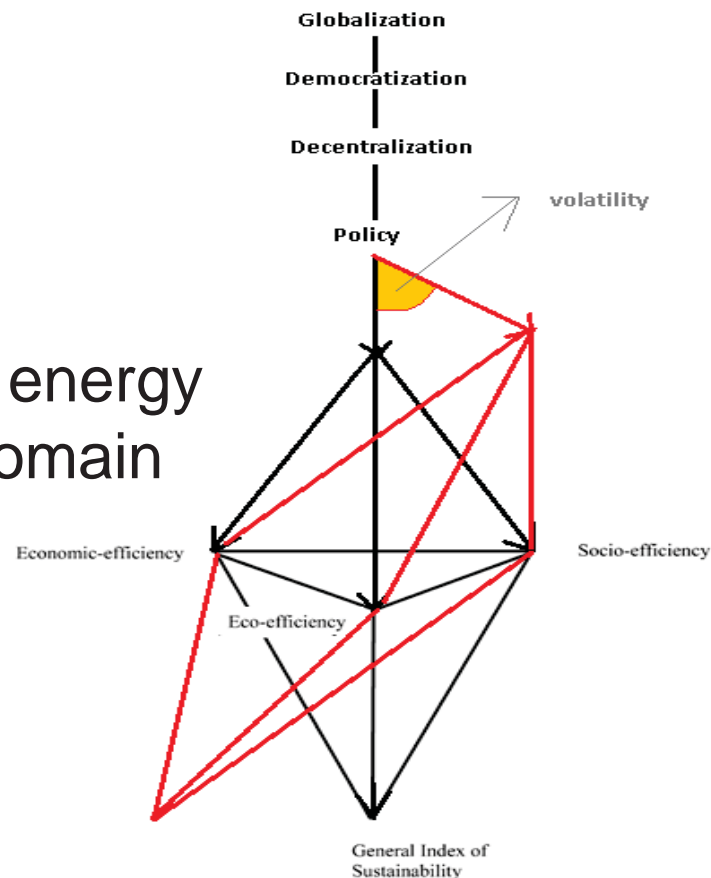
VOLATILITY IN NATIONAL SUSTAINABLE ENERGY DEVELOPMENT

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BY THE ASSUMPTION WE DEFINE VOLATILITY IN NATIONAL DEVELOPMENT

Volatility of Local Energy Development (VLED):
measure of local policy deviation with respect to
correct pathway & direction

In the other word : VLED
is standard deviation of
value added per capita of energy
sector in a specific time domain



WHAT CAN WE SAY ABOUT VLED?

In a regression model , we have the following model:

$$vol_t = \alpha G_t(v_1, v_2, v_3, \dots) + \varepsilon_t \quad t = \textit{Specific time domain}$$

where vol_t is VLED and $G_t(\cdot)$ is a multivariate function, both defined in a specific time domain, $G_t(\cdot)$ represents a set of normalized instrumental macroeconomic ,social and environmental variables:

the standard deviation of the inflation rate,

a measure of real exchange rate misalignment,

the standard deviation of terms of trade shocks,

the frequency of systemic banking crises.

the standard deviation of the job opportunity

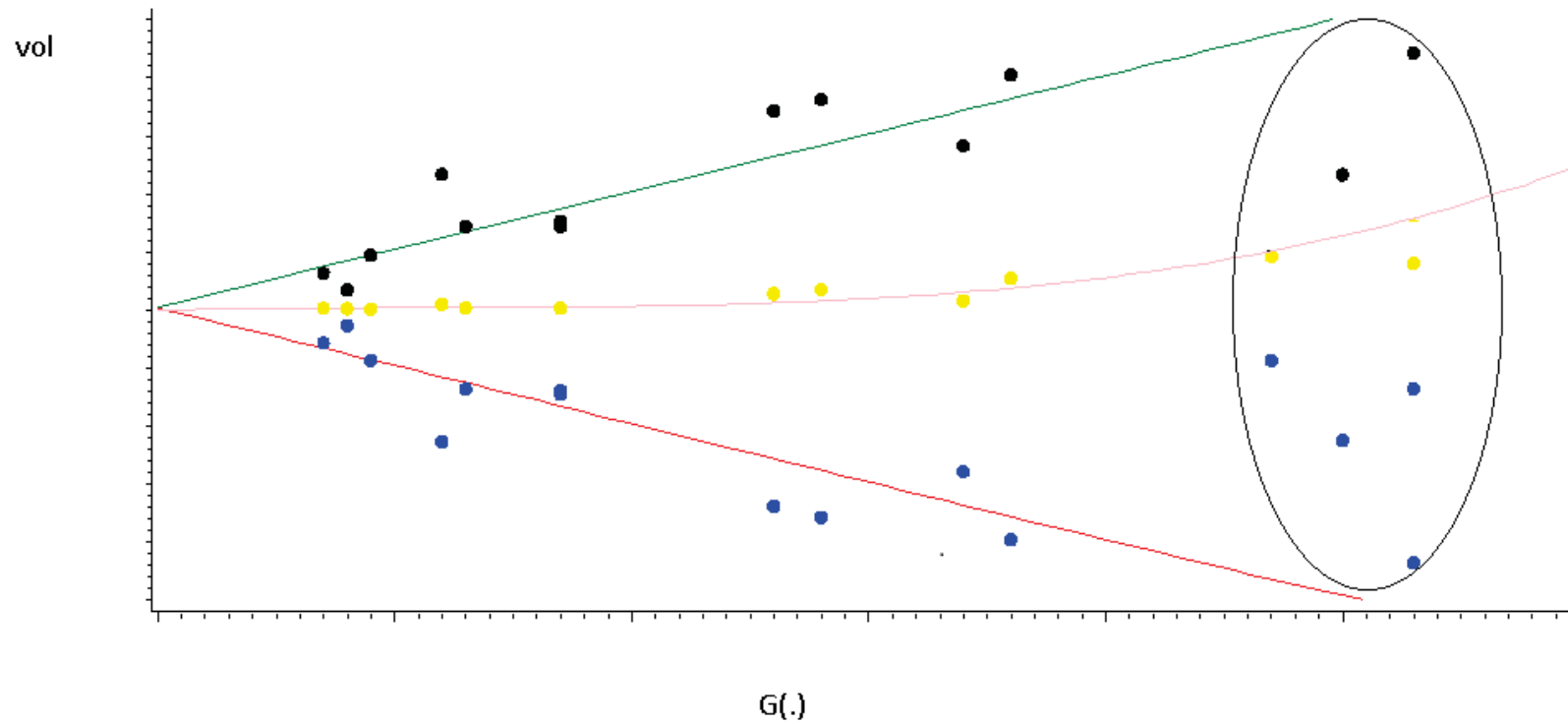
the frequency of CO₂ emissions (CO₂ emissions will lead to environmental disastrous effects, SO₂ & NO_x emissions and suspended particulate matter will further contribute to this)

CONTINUED...

We then repeat the regression analysis with and without interaction terms and instrumental variables for the database organized as country averages in a *specific time domain*(t) which is need for one or two or three or ... development planning (for example in our country these time domain divided on five years respectively).

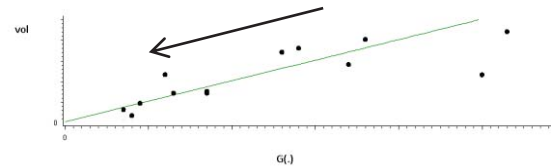
Analyzing Models

AFTER ANALYZING YOU MAY HAVE ONE CASE OF THE VARIOUS CASES WHICH ARE POINTED IN THE FOLLOWING FIGURE:

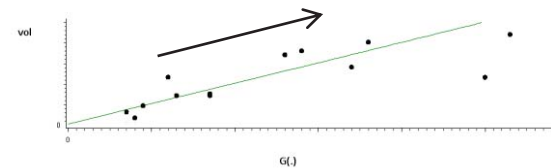


HOW CAN WE ANALYZE THE FIGURE?

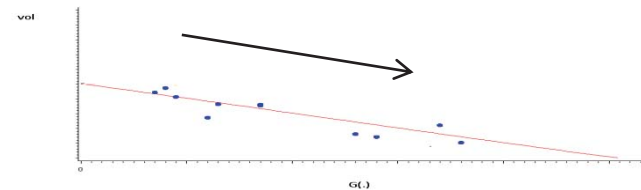
Decreasing w.r.t. t we can say that correct path. & direction



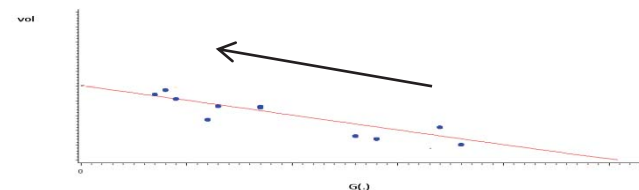
Increasing w.r.t. t we can say that correct path. & incorrect direction



Decreasing w.r.t t and rate of GDP >0
We can say that incorrect path. & direction & if rate of GDP <0 then Correct path. & incorrect direction

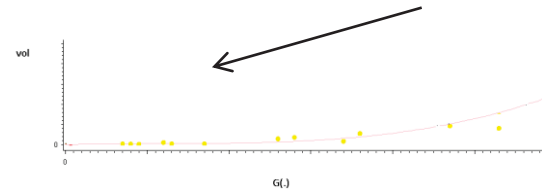


Increasing w.r.t t and rate of GDP >0
We can say that fluctuation in correct path. & correct direction & if rate of GDP <0 ,correct path. & incorrect direction

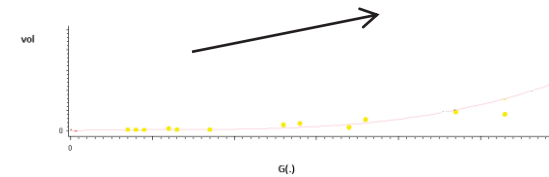


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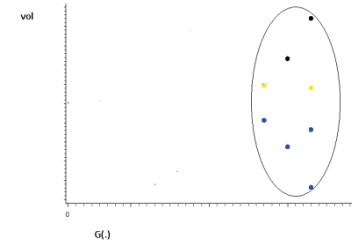
Decreasing w.r.t. t we can say that exact correct path. & direction



Increasing w.r.t. t we can say that correct path. & incorrect (reversed) direction



Description is difficult & need to more analysis



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THANK YOU

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