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A STUDY OF THE EFFECT OF INNOVATION CAPABILITY ON FINANCIAL AND MARKET PERFORMANCE WITH THE MEDIATING ROLE OF INNOVATION PERFORMANCE

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ABSTRACT

The purpose of this study is investigating the effect of Innovation capability on Financial and Market Performance according to the intervening variable of Innovation performance. For data collection by library and field method has been used. This study is quantitative research and this study in terms of purpose is applied research and in terms of method is descriptive – regression study. The results of confirmatory factor analysis indicate the construct validity of the questionnaire. The statistical population of this study is consisted all representatives of Iran Khodro that they are 800 representatives in Iran. For evaluation of sample size according to the Morgan table, sample size is 260 representatives. In current research, the sampling method was used by the simple randomly sampling and in order to determine reliability of the variables, Alpha Cronbach method has been used which its value is 0.821 and has reliability. Estimation of the model and test of hypotheses show that there is positive and significant effect between Innovation Capability and financial and marketing performance according to the intervening variable of Innovation performance. The results show that all hypotheses are confirmed.

KEYWORDS: *Market Performance, Process Innovation, Organizational Innovation, Innovation Capability, Innovation of goods and Services*

INTRODUCTION

In changing environment based on knowledge, innovative organizations can maintain their identity and respond the customer' needs. In fact, one can say that innovative organizations can respond environmental challenge rapidly and better. Innovation can be defined as new, conservative and success changes in market. Innovation is a window from new opportunities, for this reason, organizations prepare innovative activities and identify the resources and limitations and restore resources and limitations (Chopani, 2011).

Today, reliability in working place replaced with instability and in confidence and traditional and old industries substituted with new and advanced ones, there is an opportunity to use old skills and in fact, the future shall be formed as a relation and used threats and opportunities, because each invention makes changes which can cause an opportunity for persons who react immediately. Manufacturing organizations and institutes shall recognize it as if offer new services and commodities or restore them. Innovation emphasizes upon unknown and as with risk which cannot satisfactory results. Thus, failure on investment cause special conditions which is resulted to organization failure. The resistance means following because forever the rivals are to invest in innovation better and warrant better opportunities. For example, Schumpeter as one of the pioneers of innovation theory cited it for successful of commercial institutes and society. From economic point of view, Schumpeter is the first writer who considers innovation as main factor for imbalance in health economy. It discriminated him from other traditional economists as for balance theory (Khodada Hosseini, 2011).

RESEARCH PROBLEM

Today, organizations confront with environment where its specifications are complexity, globalization and dynamism, thus, organizations need more attention to development and enhance skills and internal abilities in order to exit from new challenges which are done by organizational knowledge and mental capital and organizations apply it in order to obtain better performance in business world. Mental knowledge and capital is recognized as reliable strategy to obtain and maintain competitive advantage (Pahlavanian, 2012).

Also, current organizations shall consider innovation as necessary strategy in order to stay in new competition sphere and identify environmental changes and variations, shall respond the challenges suitable. In environment changes knowledge, because of change of organizational competition, by rapid changes, innovation shall be considered more. For this reason, from the problems which the managers confront with it, are the actions for development of innovation in organization because in current decades, by dominancy of competition culture in economic, political, social and organizational sphere, innovation is inseparable section of society into micro levels of organization. Thus, the companies and organizations which want to maintain competitive advantage, shall be flexible and changeable. In same period, innovation is regarded as main aisle of organizations (Zarin sib, 2011). Organizations maintain innovation in order to maintain new products and promote interest and competitive situation. A good innovative system shall estimate organizational innovative performance by good management. Organizational innovation is one of the vital capabilities of an organization. Under global pressure, life cycle of the products shall be shorter gradually and necessities and requirements of quality and speed are increased. There are many factors which influence on organizational innovation which are resource of management, research and development, methods for doing, behaviors and ideas. Currently, majority of organizations estimate their innovation in terms of financial and quantitative indicators and mental

judgments of managers. Generally, effective factors and mental judgment of the managers shall be considered in estimation of innovation. Under the situations, evaluation of innovative performance is under lacking confidence (Chen C., 2007).

Creativity and innovation is ability for creation of new ideas and discover new methods to view problems, opportunities and innovative ideas to solve conflicts in the form of idea which is out of good constrain and more conflict, creative result (Meloche et al., 2009).

Research Objectives

Research Main Objective:

To investigate the effect of Innovation Capability on financial and marketing performance

According to the mediating variable Innovation performance

Research Minor Objectives

To investigate the effect of Innovation Capability on Organizational Innovation

To investigate the effect of Innovation Capability on Process innovation

To investigate the effect of Innovation Capability on Innovation of goods and Services

To investigate the effect of Innovation Capability on Marketing Innovation

To investigate the effect of Innovation of goods and Services on Innovation performance

To investigate the effect of Marketing Innovation on Innovation performance

To investigate the effect of Organizational Innovation on Innovation performance

To investigate the effect of Process innovation on Innovation performance

To investigate the effect of Innovation performance on market performance

To investigate the effect of market performance on financial performance

Research Hypotheses

1-Innovation Capability has positive and significant effect on Organizational Innovation

2-Innovation Capability has positive and significant effect on Process innovation

3-Innovation Capability has positive and significant effect on Innovation of goods and Services

4-Innovation Capability has positive and significant effect on Marketing Innovation

5-Innovation of goods and Services has positive and significant effect on Innovation performance

6-MarketingInnovation has positive and significant effect on Innovation performance

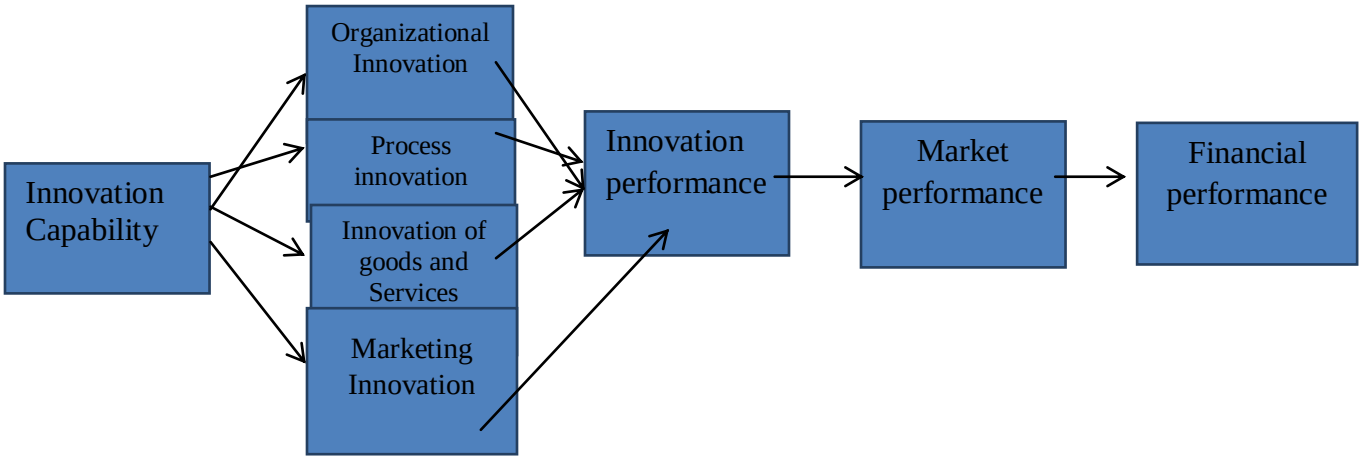
7-Organizational Innovation has positive and significant effect on Innovation performance

8-Process innovation has positive and significant effect on Innovation performance

9-Innovation performance has positive and significant effect on market performance

10-Market performance has positive and significant effect on financial performance

Research Conceptual Model



Statistical Population sample size and sample Method

The statistical population of this study is consisted all representatives of Iran Khodro that they are 800 representatives in Iran. For evaluation of sample size according to the Morgan table, sample size is 260 representatives. In current research, the sampling method was used by the simple randomly sampling.

RESEARCH METHODOLOGY:

This study in terms of purpose is applied research and in terms of method is descriptive – regression study.

Data collection Method:

For data collection by library and field method has been used.

Research Findings

Descriptive analysis of the variables

TABLE 1: DESCRIPTIVE ANALYSIS OF THE VARIABLES

More	minimize	Domain changes	variance	deviance	mode	median	average	number	
5.00	1.00	4.00	.793	89054.	3.00	3.000	2.8323	260	**Innovation Capability**
5.00	1.25	3.75	.385	.59801	3.50	3.500	3.6355	260	**Organizational Innovation**
5.00	1.33	3.67	.605	.63637	3.00	3.000	3.0512	260	**Process Innovation**
5.00	1.00	4.00	.903	.75598	5.00	4.000	3.5071	260	**Innovation of goods and Services**
5.00	1.25	3.75	.469	.67000	3.00	3.250	3.4546	260	**Marketing Innovation**

5.00	1.67	3.33	.407	.84224	4.00	3.666	3.5250	260	**Innovation performance**
5.00	1.50	3.52	.400	.63238	3.50	3.500	3.5609	260	**Market performance**
5.00	1.00	3.72	.415	.64251	3.00	3.000	3.7535	260	**Financial performance**

Research Regression

First Hypothesis:

Innovation Capability has positive and significant effect on Organizational Innovation

TABLE 2: CORRELATION COEFFICIENT OF RESEARCH MAIN HYPOTHESIS

R^2modified	R^2	Correlation coefficient	Model
.470	.473	.692	

TABLE 3: ANOVA OF THE FIRST HYPOTHESIS

Model	Sum of squares	Df	Mean square	F	Sig
Regression	95.421	1	95.421	392.154	000
Residual	85.258	382	.235		
Total	180.769	383			

TABLE 4: TABLE OF LINEAR REGRESSION ANALYSES FOR RESEARCH FIRST HYPOTHESIS

Sig value	T statistics	Standardized coefficients	Non standardized coefficients		Model
		Beta	Standard error	B	
000	7.687	.692	.135	1.269	**Width from destination**
000	19.058		.34	.720	**Innovation performance**

According to ANOVA table, significant level equals to zero which is less than 0.05, thus, H0 is rejected and according to H1, Innovation Capability influences on Organizational Innovation.

According to the table of T statistics and based on B1 and B0 which are opposite of zero, it concludes that Innovation Capability plays modifier role in linear regression and since correlation coefficient for identifying the effect of innovation performance on Organizational Innovation is R=0.692 and determination coefficient is R^2=0.473, it shows that by Innovation Capability, 47% of Organizational Innovation shall be predicated.

Regression equation is as follows:

$$\mathbf{Y=1.269+0.720X_1}$$

Second Hypothesis:

Innovation Capability has positive and significant effect on Process innovation.

TABLE 5: CORRELATION COEFFICIENT OF RESEARCH THE FIRST MINOR HYPOTHESIS

R^2modified	R^2	Correlation coefficient	Model
.716	.511	.512	

TABLE 6: ANOVA FOR THE SECOND HYPOTHESIS

Model	Sum of squares	Df	Mean square	F	Sig
Regression	99.571	1	99.571	401.599	**000**
Residual	94.721	259	.248		
Total	194.291	260			

TABLE 7: TABLE OF LINEAR REGRESSION ANALYSES FOR RESEARCH THE SECOND HYPOTHESIS

Sig value	T statistics	Standardized coefficients	Non standardized coefficients		Model
		Beta	Standard error	B	
000	8.268	.716	.126	1.043	**Width from destination**
000	20.039		.038	.761	**Innovation performance**

According to ANOVA table, significant level equals to zero which is less than 0.05, thus, H0 is rejected and according to H1, Innovation Capability influences on Process innovation. According to T statistics and in terms of B1, B0 which are opposite zero, one concludes that Innovation Capability plays modifier role in linear regression and since correlation coefficient is R=0.716 and determination coefficient R^2=0.512, it shows that by Innovation Capability, 51% of Process innovation shall be predicated.

Regression equation is as follows:

$$\mathbf{Y=1.043+0.761X_1}$$

Third Minor Hypothesis:

Innovation Capability has positive and significant effect on Innovation of goods and Services.

TABLE 8: CORRELATION COEFFICIENT OF RESEARCH THE THIRD HYPOTHESIS

R^2modified	R^2	Correlation coefficient	Model
.327	.331	.583	

TABLE 9: ANOVA FOR THIRD HYPOTHESIS

Model	Sum of squares	Df	Mean square	F	Sig
Regression	35.552	1	35.552	120.458	000
Residual	118.514	259	.305		
Total	154.066	260			

TABLE 10: TABLE OF LINEAR REGRESSION ANALYSES FOR RESEARCH THE THIRD HYPOTHESIS

Sig value	T statistics	Standardized coefficients	Non standardized coefficients		Model
		Beta	Standard error	B	
000	15.592	.583	.148	2.024	**Width from destination**
000	11.833		.49	.567	**Innovation performance**

According to ANOVA table, significant level equals to zero which is less than 0.05, thus, H0 is rejected and according to H1, Innovation Capability influences on Innovation of goods and Services. According to the table of T statistics and based on B1 and B0 which are opposite of zero, it concludes that Innovation Capability plays modifier role in linear regression and since correlation coefficient for identifying the effect of Innovation Capability on Innovation of goods and Services is R=0.568 and determination coefficient is R^2=0.316, it shows that by Market performance, 31% of Innovation of goods and Services shall be predicated.

Regression equation is as follows:

$$\mathbf{Y=2.024+0.567X_1}$$

Fourth Minor Hypothesis:

Innovation Capability has positive and significant effect on Marketing Innovation

TABLE 11: CORRELATION COEFFICIENT OF RESEARCH THE FOURTH HYPOTHESIS

R^2modified	R^2	Correlation coefficient	Model
.402	.407	.625	

TABLE 12: ANOVA FOR FOURTH HYPOTHESIS

Model	Sum of squares	Df	Mean square	F	Sig
Regression	53.462	1	53.462	132.472	000
Residual	148.657	259	.305		
Total	202.119	260			

TABLE 13: TABLE OF LINEAR REGRESSION ANALYSES FOR RESEARCH THE FOURTH HYPOTHESIS

Sig value	T statistics	Standardized coefficients	Non standardized coefficients		Model
		Beta	Standard error	B	
000	15.517	.625	.179	2.245	**Width from destination**
000	12.845		.092	.627	**Innovation performance**

According to ANOVA table, significant level equals to zero which is less than 0.05, thus, H0 is rejected and according to H1, Innovation Capability influences on Marketing Innovation. According to the table of T statistics and based on B1 and B0 which are opposite of zero, it concludes that Innovation Capability plays modifier role in linear regression and since correlation coefficient for identifying the effect of Innovation Capability on Marketing Innovation is R=0.625 and determination coefficient is R^2=0.407, it shows that by Market performance, 31% of Marketing Innovation shall be predicated.

Regression equation is as follows:

$$\mathbf{Y=2.245+0.627X_1}$$

Multi- Regression

Hypotheses of Fifth until Eighth

5-Innovation of goods and Services has positive and significant effect on Innovation performance

6-MarketingInnovation has positive and significant effect on Innovation performance

7-Organizational Innovation has positive and significant effect on Innovation performance

8-Process innovation has positive and significant effect on Innovation performance

TABLE (14): COEFFICIENT OF REGRESSION FOR HYPOTHESES FIFTH UNTIL EIGHTH

JustifiedR^2	R^2	Coefficient of Regression	Model
.344	.351	.593	

TABLE (15): ANOVA OF HYPOTHESES FIFTH UNTIL EIGHTH

Model	Sum of squares	Df	Mean square	F	Sig
Regression	60.379	1	15.095	51.285	**000**
Residual	111.551	259	.294		
Total	171.930	260			

TABLE (16): ANALYSES OF LINE REGRESSION FOR HYPOTHESES FIFTH UNTIL EIGHTH

Sig	tStatistics	Standardized coefficients	Coefficients not standardized		
		Beta	Standard error	B	
000	4.012		.214	. 857	**Width from destination**
000	3.529	.157	.034	.118	**Innovation of Good and Services**
000	5.918	.269	.051	.301	**Innovation of Business**
000	8.317	.372	.047	.391	**Innovation of Organization**
000	8.547	.325	..43	.382	**Innovation of Process**

According to ANOVA table, significant level equals to zero which is smaller than 0.05, thus, H0is rejected and according to H_1 Hypothesis that the variables of product and service innovation, marketing innovation, organizational innovation, and process innovation has effect on innovation performance. According to the table of T statistics and based onB1, B2, B3, B4 and B0 which are opposite of zero, it concludes that the variables of product and service innovation, marketing innovation, organizational innovation, and process innovation play a role in the linear regression and where the coefficient is Multiple correlations to determine the magnitude of the impact of product, service, marketing, organizational and process variables on innovation performance are R = 0.593 and coefficient of determination is R^2 = 0.351 indicating that up to 35% of innovation performance through the four variables mentioned shall be predicted.

Ninth Hypothesis

Innovation performance has positive and significant effect on market performance.

TABLE (17): NINTH HYPOTHESIS OF REGRESSION COEFFICIENT

R^2Modified	R^2	Regression Coefficient	Model
.231	.239	.478	

TABLE (18): ANOVA OF NINTH HYPOTHESIS

Model	Sum of squares	Df	Mean square	F	Sig
Regression	32.482	1	32.482	121.560	**000**
Residual	115.250	259	.305		
Total	147.732	260			

TABLE (19):ANALYSES OF LINE REGRESSION - NINTH HYPOTHESIS

Sig	Statistics t	Coefficients standardized	Coefficients not standardized		Model
		Beta	standard error	B	
000	13.551	.478	.152	1.422	Width from destination
000	10.115		.46	.506	Innovation performance

According to ANOVA table, significant level equals to zero which is less than 0.05, thus, H0is rejected and according to H1Innovation performance has effect on market performance. According to the table of T statistics and based on B1 and B0 which are opposite of zero, it concludes that Innovation performance has role in linear regression and since correlation coefficient for identifying the effect on Innovation performance on Market performance is R=0.478 and determination coefficient is R^2=0.239, it shows that by Innovation performance,24 % of Market performance shall be predicated.

Regression equation is as follows:

$$Y=1.422+0.506X_1$$

Tenth Hypothesis

Market performance has positive and significant effect on financial performance.

TABLE (20): REGRESSION COEFFICIENT OF TENTH HYPOTHESIS

R^2Modified	R^2	Regression Coefficient	Model
.312	.316	.568	

TABLE (21): ANOVA OF TENTH HYPOTHESIS

Model	Sum of n squares	Df	Mean square	F	Sig
Regression	47.504	1	47.504	128.312	000
Residual	125.621	259	.368		
Total	172.725	260			

TABLE (22): ANALYSES OF LINE REGRESSION OF TENTH HYPOTHESIS

Sig	Statistics t	Coefficients standardized	Coefficients not standardized		Model
		Beta	standard error	B	
000	14.541	.568	.142	1.621	Width from destination
000	10.746		.040	.476	Market performance

According to ANOVA table, significant level equals to zero which is less than 0.05, thus, H0is rejected and according to H1 market performance has effect on financial performance. According to the table of T statistics and based on B1 and B0 which are opposite of zero, it concludes that market performance has role in linear regression and since correlation coefficient for identifying the effect on market performance on financial performance is R=0.568 and determination coefficient is R^2=0.316, it shows that by market performance, 31 % of financial performance shall be predicated.

Regression equation is as follows:

$$\mathbf{Y=1.621+0.476X_1}$$

CONCLUSION

Today, organizations shall consider innovation as necessary strategy in order to survive in new paradigm of competition among organizations which is based on competition and knowledge and identify environmental changes and variations to confront them, as well recognize organizational indicators effective on organizations and respond suitable. The organizations shall pay attention to development and enhancement of internal skills and abilities which is done by bases of organizational knowledge and mental capital and apply them in order to reach in better performance in business world. At same time, service as a section which its efficiency is increasing and added its dominancy, can influence on innovation processes. The organizations cannot emerge their hidden talents shall be defeated by others which have power to apply skills and offer products by low cost and have talented management by vast horizon. Thus, if we have successful economy, we need successful companies in competitive environment and this is required powerful human resource. This condition influences on long term competitions and survival of organizations, thus, management shall consider the efforts which are done to extend innovation of organization and revise them. Each organization shall recognize which specifications shall be suitable for nature of company and emphasize upon specifications that effective for organizational innovation and staff. The effect of studies especially on organizations which are innovation and renovation can be valuable for experts of human resource and innovation who comprehend systematic relations among the concepts. Organizational, group, financial and environmental factors are regarded as most important and basic ones effective on development of innovation in current organizations which provide necessary field for growth and development. It is necessary to design and determine model which has all inter-organizational factors on development of innovation and its lacking is regarded as theoretical gap.

In this research, all hypothesizes are confirmed as if enabling of innovation has positive and significant effect on organizational innovation, procedural innovation, innovation of commodities and marketing innovation. Also, organizational innovation, procedural innovation, innovation of commodities and services, marketing innovation have positive effect on performance of innovation and market performance and finally, market performance has direct and significant relation with financial performance. Therefore, in this research, positive and significant effect of enabling innovation was confirmed and proved by innovation performance, market performance and financial performance.

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CLIMATE CHANGE, ENVIRONMENT AND ECONOMIC DEVELOPMENT CLIMATE CHANGE- ORIGIN, CONCEPT, MEASURES, IMPACTS, MITIGATION AND ADAPTION

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ABSTRACT

Climate change is term that refers to any significant and long-term change in average weather in a given region or entire Earth. Basically every significant variability of average weather over longer time period can be classified as climate change. In the early beginnings of Earth's history these changes were usually caused by different dynamic processes on Earth and recently by human activities. This is the reason why term "climate change" refers in everyday talk to "modern climate change" or climate change caused by global warming. Global warming has today even become synonym for climate change because of its role in climate change as excessive emission of harmful greenhouse gases into atmosphere caused increase in average temperature that affected climate on Earth. And while fossil fuels remain dominant their combustion will continue to emit CO2 and other greenhouse gases into atmosphere and cause even more serious consequences to climate change. The United Nations Environment Programme states "climate change impacts will range from affecting agriculture- further endangering food security-, sea-level rise and the accelerated erosion of coastal zones, increasing intensity of natural disasters, species extinction and the spread of vector-borne diseases. The sad fact is that we can't prevent climate change, we can only try to adapt to it as this is something that already started and could only get worse. We caused global warming and now we are faced with the climate change as the greatest environmental challenge of them all. And though we are already aware of climate change we still lack action to prevent further increase of greenhouse gases in the atmosphere. There is lot of talk, but very little action and the possible solution (turning to renewable energy sector) is still negligible when viewed on global scale and constant increase in energy demand isn't helping either since fossil fuels are still dominant energy sources for most of the world's industry. According to different estimations, agreements, protocols and government policies of many countries, this turning to

renewable energy sector should change in years to come. But do we have this luxury of "years to come"? Is time still on our side? The United Nations Framework Convention on Climate (UNFCC) states that climate change is variation in the climate, which can be attributed to human activity, either directly or indirectly, and stresses that it must be in addition to natural variation being experienced during the same time period. It is essential to distinguish between "climate change" due to human activities and "climate variability "due to natural causes. This paper examines the issues of climate change origin, concept, measures, impacts, mitigation and adaption.

KEYWORDS: *Estimations, Agreements, Origin, Concept, Measures*

INTRODUCTION

Climate change is a change or variability in the average weather of a region. It may be a positive change in some locations which may enhance the productivity of a region, however, the rapidity of the change will cause major disruption and there will be many more losers than gains if climate change advances as predicted and as initial indications are now beginning to show.

To become fully engaged with the issue of climate change, it is important to understand the science. Understanding how the circulation of the Earth's carbon atoms drives climate change. Climate change is caused by the persistent build-up of greenhouse gases such as Carbon Dioxide (CO2) IN the Earth's atmosphere.

Many people confuse the hole in the ozone layer with the climate change. In fact, the hole in the ozone layer, which is now beginning to mend itself due to the efforts, and agreements, made worldwide for industry to limit and reduce ozone depleting emissions, has nothing to do with climate change.

For example, water vapor is not typically considered part of the climate change problem, although larger amounts of water vapor are known to be present now than in the past, and this will also have an effect on climate.

ORIGIN OF THE CLIMATE CHANGE

Climate change is a change in the statistical distribution of weather over periods of the time that range from decades to millions of years. It can be a change in the average weather or a change in the distribution of weather events around an average (for example, greater or fewer extreme weather events). Climate change may be limited to a specific region, or may occur across the whole earth.

In recent usage, especially in the context of environmental policy, climate change usually refers to changes in modern climate. It may be qualified as anthropogenic climate change, more generally known as "global warming" or "anthropogenic global warming".

For information on temperature measurements over various periods, and the data sources available, see temperature record. For attribution of climate change over the past century, see attribution of recent climate change.

Concept of climate change

Global Climate Change is a team that refers to the exploration of both the question of whether the climate of the entire planet might be changing, and why, and what the impact of those changes might be on investments in companies that may be affected by global changes in climate. Global warming has become a major concern of humanity since the middle of the 20th century. It was namely then that the first increase in the Earth's temperature was registered. For thirty years now, many scientists have been predicting that global warming could result in a future of powerful storms, rising sea levels, and widespread crop failures. The science behind these climes remains highly controversial and was strongly opposed for many years, especially by the fossil fuel industry. However, recent public sentiment in many countries has increasingly shifted towards an acceptance do the concept of global warming and the possibility that warming may be correlated to human activities. Fueled by more reliable scientific studies as well as the popular media (such as Noble Peace Prize-winner Al Gore's documentary, "An inconvenient Truth"), global climate change has emerged as a key issue in the political and economic arena. Global warming is an increasingly questioned phenomenon, and progressive national governments around the world have started taking action to respond to these environmental issues. Recent discussion in the scientific community including that incredible scientific papers and presentations, such as some presented at the January 2009 Mission Earth Seminar held in Zurich, Switzerland, attended by climatologist and peak oil experts, have exposed the failure of the vast majority of global warming research to properly account for the account of peak oil on "predictions" made regarding climate change, including those made by the IPCC. Although the "scientific consensus" in 2009 is that the planet's atmosphere is warming, and consensus appears to indicate a correlation to human activities, science by definition is constantly evolving and it would be wise recall that, for example, the concepts of Newton were considered to be the accepted scientific consensus until those concepts were superseded by the concepts of Einstein. Regardless, in the investment sphere, many companies will soon be affected by both changes in environmental legislation as well as predicted environmental results of continued climate change.

MEASURING CLIMATE CHANGE

There is no single instrument measuring climate change. Instead there are thousands of measuring devices spread across the globe, on land, under the sea and in the air.

There are a number of key factors in measuring climate change, and they are broadly categorized below. The range of instrumentation used to observe and measure climate is truly amazing. By following the links below you can see the types of instruments, and where they are used.

Temperature

When measuring climate change this is a primary and can be measured or reconstructed for the Earth's surface, and see surface temperature (SST).

Precipitation (rainfall, snowfall etc)

Offers another indicator of relative climate variation and may include humidity or water balance, and water quality.

Biomass and vegetation patterns may be discerned in a variety of ways and provide evidence of how ecosystems change to adapt to climate change.

Sea level measurements reflect changes in shoreline and usually relate to the degree of ice coverage in high latitudes and elevations.

Solar Activity can influence climate, primarily through changes in the intensity of solar radiation. **Volcanic Eruptions,** like solar radiation, can alter climate due to the aerosols that are emitted into the atmosphere and alter climate patterns.

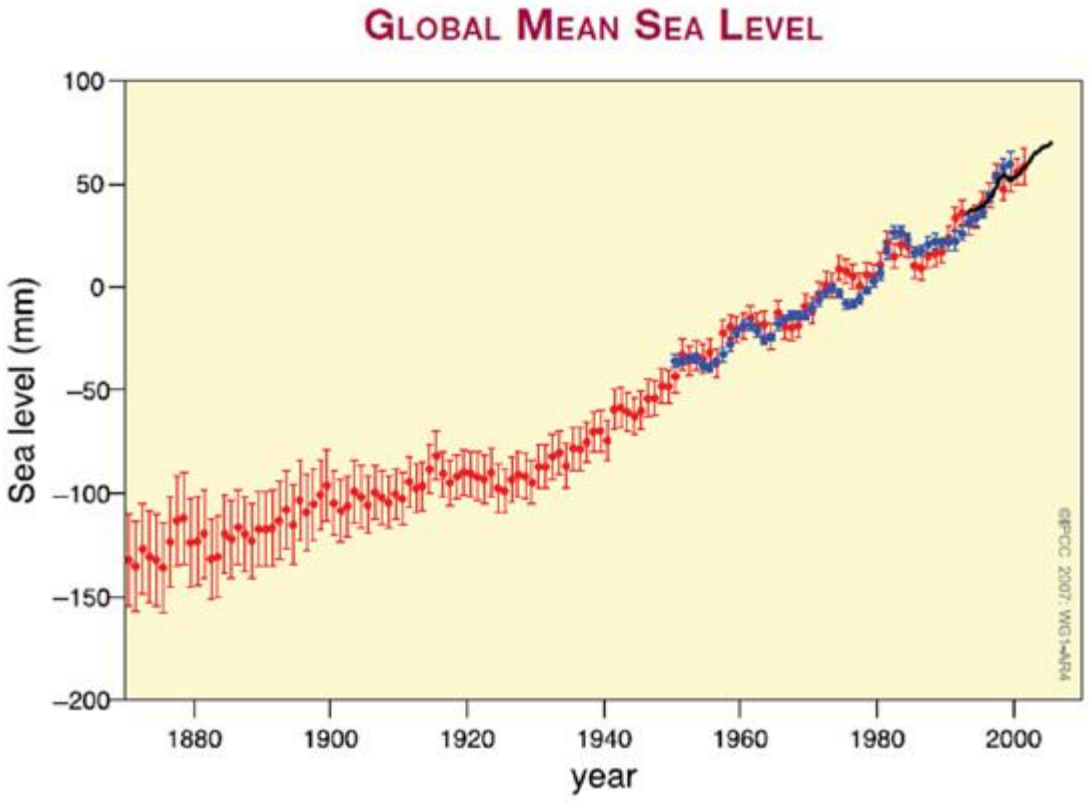
Chemical composition of air or water can be measured by tracking levels of greenhouse gases such as carbon dioxide and methane, and measuring ratios of oxygen isotopes. Research indicates a strong correlation between the percent of carbon dioxide in the atmosphere and the Earth's mean temperature.

COMBING OBSERVATION AND MEASUREMENTS

In understanding global climate changes it is necessary to combine many disciplines, including oceanography, meteorology, geomorphology, geology and pale climatology. As well as combining interdisciplinary studies, observations and measurements can be assembled over long time spans, using different measuring approaches. For example, the annual averages of the global mean sea level seen below are based on reconstructed sea level fields since 1870 (red), and the tide gauge measurements are since 1950 (blue) while

The satellite altimetry is since 1992 (black). The units are in millimeters relative to the average for 1961 to 1990 and the error bars are at 90% confidence intervals.

By combining these three different approaches, scientists are able to build a clear picture of rising sea level that would not be possible if each was presented independently. You can also see with the introduction of accurate measuring, the confidence level for accuracy increases.



CLIMATE CHANGE IMPACTS

The recent report of the Intergovernmental Panel on Climate Change is the latest scientific assessment of the impact of global warming on human, animal and plant life. The culprit is greenhouse gases, notably carbon dioxide, methane and nitrous oxide. These are accumulating to unprecedented levels in the atmosphere as a result of profligate burning of fossil fuels, industrial processes, farming activities and changing land use.

The greenhouse gases act like a blanket around the earth, trapping too much of the heat that would otherwise have escaped into space.

The IPCC is a body of 2500 scientists that brings out reports, considered the last word on the Science of Climate Change. "Warming of the Climate System is unequivocal", says the IPCC in its latest report, pointing to the increased global, air and ocean temperatures, widespread melting of snow and ice and rising sea levels.

Indian Impact

Climate change will make monsoons unpredictable. As a result, rain-fed wheat cultivation in South Asia will suffer in a big way. Total cereal production will go down. The crop yield per hectare will be hit badly, causing food insecurity and loss of livelihood.

India's economic growth would "necessarily involve increase in (greenhouse gas) emissions from the current extremely low levels." Any constraints on such emissions by India, whether direct, by way of emission targets, or indirect would reduce growth rates, the report stated. However, the report also added, "India should be willing to contain her (greenhouse gas) emissions as long as she is compensated for the additional cost involved."

The rising levels of the sea in the coastal areas will damage nursery areas for fisheries, causing coastal erosion and flooding.

The future impacts of climate change, identified by the Government of India's National Communications (NATCOM) in 2004 include

Decreased snow cover, affecting snow-fed and glacial systems such as the Ganges and Brahmaputra. 70% of the summer flow of the Ganges comes from melt water

- Erratic monsoon with serious effects on rain-fed agriculture, peninsular rivers, water and power supply
- Drop in wheat production by 4-5 million tones, with even a 1ºC rise in temperature
- Rising sea levels causing displacement along one of the most densely populated coastlines in the world, threatened freshwater sources and mangrove ecosystems
- Increased frequency and intensity of floods. Increased vulnerability of people in coastal, arid and semi-arid zones of the country
- Studies indicate that over 50% of India's forests are likely to experience shift in forest types, adversely impacting associated biodiversity, regional climate dynamics as well as livelihoods based on forest products.

India stands to lose on too many counts to allow a 'climate-politics-as-usual' scenario. Therefore, positive engagement with global climate negotiations at the next UNFCCC meeting in December 2009 is crucial.

CLIMATE CHANGE MITIGATION

Climate change mitigation is action to decrease the intensively of irradiative forcing in order to reduce the potential effects of global warming. Mitigation is distinguished from adaption to global warming. Most often, climate change mitigation scenarios involve reductions in the concentrations of greenhouse gases, either by reducing their sources or by increasing their sinks.

Scientific consensus on global warming, together with the precautionary principle and the fear of abrupt climate change is leading to increased effort to develop new technologies and sciences and carefully manage others in an attempt to mitigate global warming. Most means of mitigation appear effective only for preventing further warming, not at reversing existing warming.

The energy policy of the European Union has set a target of limiting the global temperature rise to 2 0c [3.6 oF] compared to preindustrial levels, of which 0.8 o0C has already taken place and another 0.5 o C Is already committed the 2 oC rise is typically associated in climate models with a carbon dioxide concentration of 400-500 ppm by volume; the current level as of January 2007 is 383 ppm by volume, and rising at 2 ppm annually. Hence, to avoid a very likely breach of the 2 oC target, CO2 levels would have to be stabilized very soon; this is generally regarded as unlikely, based on current programs in place to date. The importance of change is illustrated by the fact that world economic energy efficiency is presently improving at only half the rate of world economic growth.

How climate change affects India

Precisely at a time when India is confronted with development imperatives, we will also be severely impacted by climate change. Like other developing countries, several sections of the Indian populace will not be able to buffer themselves from impacts of global warming. With close economic ties to natural resources and climate-sensitive sectors such as agriculture, water and forestry, India may face a major threat, and require serious adaptive capacity to combat climate change. As a developing country, India can little afford the risks and economic backlashes that

industrialized nations can. With 27.5% of the population still below the poverty line, reducing vulnerability to the impacts of climate change is essential[15].

It is in India's interest to ensure that the world moves towards a low carbon future. Many studies have underscored the nation's vulnerability to climate change. With changes in key climate variables, namely temperature, precipitation and humidity, crucial sectors like agriculture and rural development are likely to be affected in a major way.

Impacts are already being seen in unprecedented heat waves, cyclones, floods, Stalinization of the coastline and effects on agriculture, fisheries and health. India is home to a third of the world's poor, and climate change will hit this section of society the hardest. Set to be the most populous nation in the world by 2045, the economic, social and ecological price of climate change will be massive.

Climate change adaptation activities in India

This report, to support the implementation of UNDP's India country Programme Action Plan 2008-2012, is based on an assessment study on climate change adaptation activities in the country.

Some degree of future climate change will occur regardless of future green house gas emissions. Adapting to or coping with climate change will therefore become necessary in certain regions and for certain socioeconomic and environmental systems. The need for adaptation may be increased by growing populations in areas vulnerable to extreme events. However, according to the IPCC, "adaptation alone is not expected to cope with all the projected effects of climate change, and especially not over the long term as most impacts increase in magnitude."

The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as the "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities"

The purpose of this study is to review management options for adapting to climate variability and change in the United States, and to identify characteristics of ecosystems and adaptation responses that promote successful implementation and meet resource managers' needs. The following questions will be addressed in this study:

- What are the management goals in the selected systems, upon what ecosystem characteristics do these goals depend, what are the stressors of concern, what are the management methods currently being used to address those stresses, and how could climate variability and change affect attainment of management goals?
- For selected case studies, what is the current state of knowledge about management options that could be used to adapt to the potential impacts of climate variability and change?
- Looking across the case studies, what are the factors that affect the successful implementation of management actions to address impacts from climate variability and change?
- For each case study, how should we define and measure the environmental outcomes of management actions and their effect on the resilience of ecosystems to climate variability and change?

The extent of climate change impacts upon different ecosystems, regions and sectors of the economy will depend not only on the sensitivity of those systems to climate change, but also on the systems' ability to adapt to climate change.

An example of an adaptation strategy to prevent damage from climate change is shore protection (e.g., dikes, bulkheads, beach nourishment), which can prevent sea level rise from inundating low-lying coastal property, eroding beaches, or worsen flooding. If the costs or environmental impacts of shore protection are high compared with the property being protected, an alternative adaptation strategy would be a planned retreat, in which structures are relocated inland as shores retreat.

Adaptation to environmental change is not a new concept. Human societies have shown throughout history a strong capacity for adapting to different climates and environmental changes. For example, farmers, foresters, civil engineers, and their supporting institutions have been forced to adapt to numerous challenges to overcome adversity or to remove important impediments to sustained productivity.

Examples of adaptation and coping strategies with current climate fluctuations include farmers planting different crops for different seasons, and wildlife migrating to more suitable habitats as the seasons change.

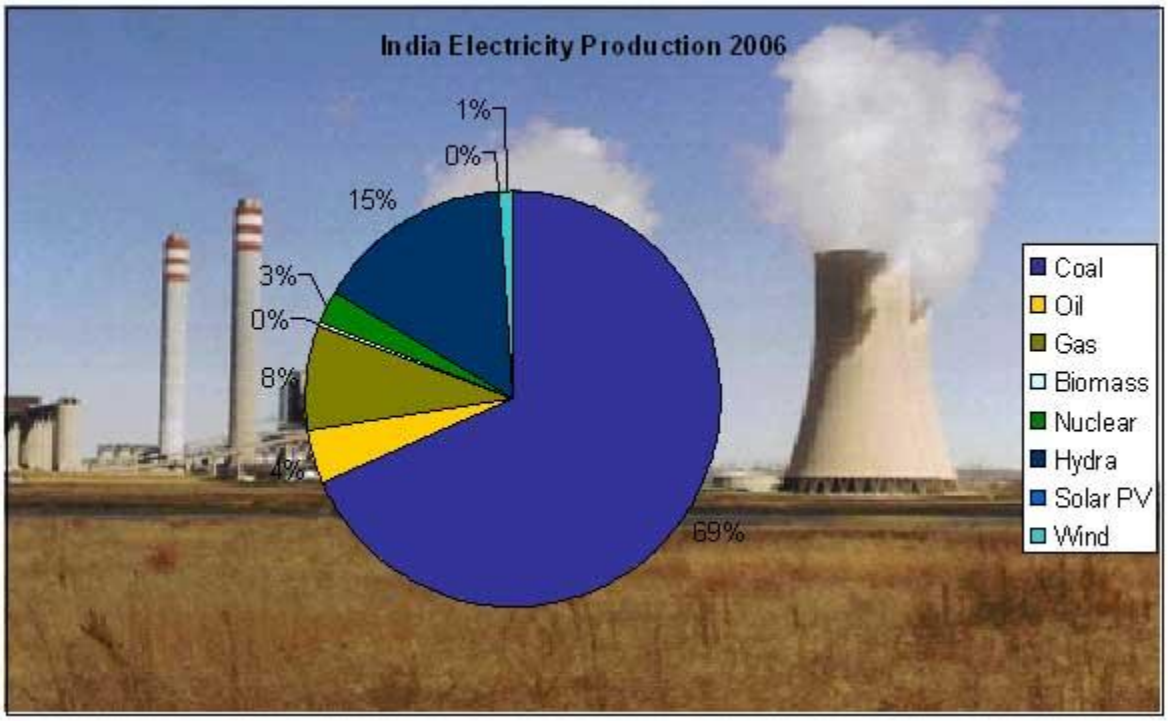
Nevertheless, human society and the natural environment are not entirely protected against, nor perfectly adapted to, current climate variability and extreme weather events. Current economic losses from climate variations and extremes can be substantial. These losses indicate that society is vulnerable and that adaptation has not been sufficient to offset damages associated with current variations in climatic conditions.

India's accelerating emissions

Although not an emitter historically, India currently has one of the fastest growing economies in the world. With a government target of 8% GDP to achieve developmental priorities, a share of one sixth of the global population, and changing consumption patterns, India's emissions are set to increase dramatically.

Growing at an almost breakneck pace, and guzzling coal, gas and oil in large quantities, we are today, the fourth largest emitter of greenhouse gases worldwide. Although our per-capita emissions are among the lowest in the world, our growth rates imply that the past is no predictor of the future[8]. The most recent IPCC report suggests that India will experience the greatest increase in energy and greenhouse gas emissions in the world if it sustains a high annual economic growth rate. The International energy Agency predicts that India will become the third largest emitter of greenhouse gases by as early as 2015.

India imports large quantities of fossil fuels to meet its energy needs, and the burning of fossil fuels alone accounts for 83% of India's carbon dioxide emissions. Nearly 70% of our electricity supply comes from coal.



Although India has maintained its clear economic and social development imperatives, the government recognizes that climate change is an serious problem, and that business as usual is no longer the way forward.

CONCLUSION

We need to know just about everything. ...Is climate system modeling the ultimate example of hubris, or, by chopping away at areas of ignorance, will we truly improve our predictive Capability? Current climate models tend to predict gradual climate change. This is no guarantee against unpleasant surprises. Building a balanced public perception of the risks posed by climate change is difficult. There is an almost irresistible temptation to view extreme weather events, like droughts or storms, as signs of climate change, even if they are well within the limits of natural variability. At the same time, gradual change tends to go unnoticed. Natural climatic variability can lead to temporary cooling; these would be perceived as all-clears by many. We are up against a long-distance race and tend towards a sprinter's outlook Human-made greenhouse gases and aerosols will change our climate. There is no free lunch; we cannot alter earth's radiation balance for nothing. It is uncertain by how much, how swiftly and with what twists the climate will change. This is dubious comfort, since uncertainty cuts two ways. The present best estimates may well overstate the risk, but they may as well understate it. Climate change resembles a gamble with high stakes.

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