



International Journal of
**Investment
Management and
Financial Innovations**

Keywords

Sustainability,
Combined Sustainable
Development Index (CSDI),
Biodiversity,
Society Approximation of SD,
Composite Progressive
Indicators (CPI),
Armenian Composite
Appraising Supportive Progress
(ACASP)

Received: June 30, 2015

Revised: July 15, 2015

Accepted: July 16, 2015

Approximation of Indicators in Society Magnitude as per Armenian Composite Appraising Supportive Progress (ACASP)

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Citation

Azniv Felix Petrosyan. Approximation of Indicators in Society Magnitude as per Armenian Composite Appraising Supportive Progress (ACASP). *International Journal of Investment Management and Financial Innovations*. Vol. 1, No. 4, 2015, pp. 77-88.

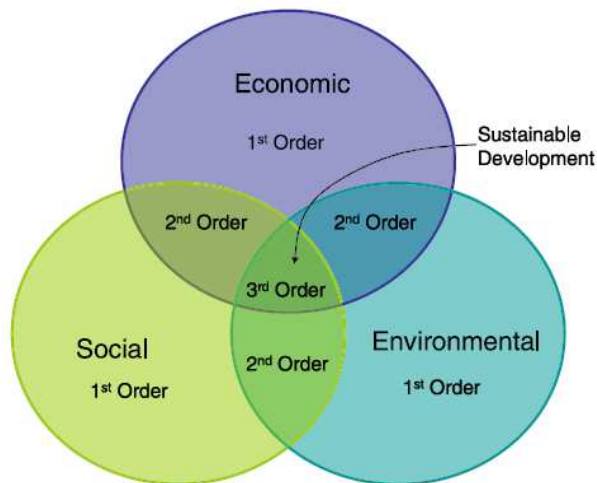
Abstract

Sustainable Development (SD) is one of the recent accentuated areas. Moreover, Sustainable Development has supplementary influence on society rather than ecological themes, which can entirely modify the vision of the earth. Although sustainability has never been accurately calculated, Composite Appraising Supportive Progress (CASP) is an innovative index to assess Combined Sustainable Development Index (CSDI). Development and biodiversity are very incorporated whereas SD achievements can be improved through assessments of biodiversity. Biodiversity concept is applied to CASP carrying 3 D - Dimensions: Genes - Society, Species - Economy and Environment - Nature. The current paper will emphasize on society magnitude from 3D of Armenian Composite Appraising Supportive Progress (ACASP). 6 categories of society magnitude for Armenian Society of CASP as per existing Armenian Statistic Data are as: Humans - Demography; Society Concerns - Employment; Knowledge in Practice - Education; Space Science - Science; Political Performances - Economic Activities; Transport - Transport and Communication. In addition, 6 aforementioned categories are applied as per spontaneous estimation of biodiversity concept in CASP of Armenia. Composite Progressive Indicators (CPI) are approximated with the procedures using appearance of Armenian statistic data with previously defined Greek CASP. An approximation of composite indicators leads to develop Armenian CASP. Particularly, evaluation of composite indicators in society magnitude is performed to propose the new model of CASP in Armenia.

1. Introduction

Petrosyan (2014) mentions on sustainability (*Picture 1*) as the current main topic whereas Nijkamp and Vreeker (2000) concentrates on 3 magnitudes of SD as:

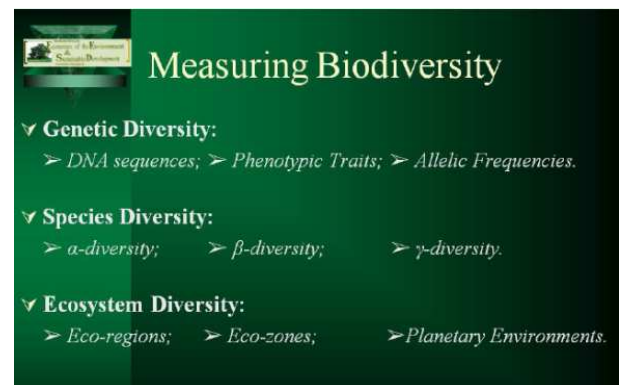
- Bagheri and Hjorth (2008) for being neither a reductive status of the system nor a realizable static aim;
- Korhonen (2003) for never being accurately calculated;
- Opdam etc (2006) for requiring on landscape structures to support processes of ecology, society and economy; to deliver goods and services for present & prospect generations; to sustain natural stability through key resources; and to make decisions on environmental patterns and functions.



Source: Walton etc (2005)

Picture 1. Primary Concept of SD.

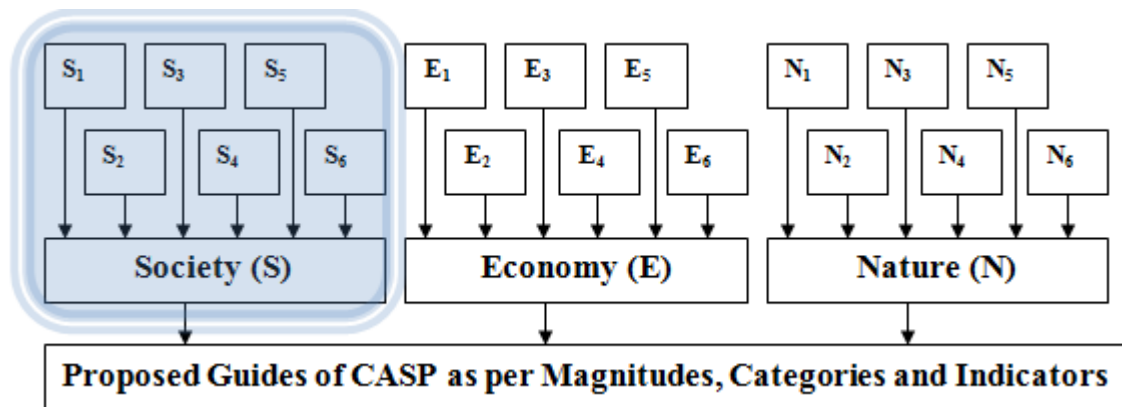
the biodiversity concept within last 10-15 years. Petrosyan (2005) reorganizes the review of biodiversity stages in *Picture 2* aiming on Pearce and Moran (1994); Nunes etc (2000) and OECD (2001) papers.



Sources: Petrosyan (2005)

Picture 2. Review of Biodiversity Stages.

The emphasis of Godron etc(2005) is on the appearance of



Sources: Petrosyan (2014)

Picture 3. Projected Expressions of CASP through Magnitudes, Categories & Indicators.

2. Literature Review

The book of Petrosyan (2014) coincides with the paper of Petrosyan (2010) in *Table 1* and *Picture 3* which is postured to

integrate three (3) magnitudes, such as society (S), economy (E) and nature (N), with group of six (6) categories per each magnitude.

Table 1. Eighteen (18) Categories of CASP.

S	Society	E	Economy	N	Nature
S ₁	Humans	E ₁	Banking Union	N ₁	Land
S ₂	Society Concerns	E ₂	Human Standards	N ₂	Water
S ₃	Knowledge in Practice	E ₃	Production and Consumption	N ₃	Air
S ₄	Space Science	E ₄	Agriculture	N ₄	Biodiversity
S ₅	Political Performance	E ₅	Industry	N ₅	Energy
S ₆	Transport	E ₆	Tourism	N ₆	Environment

Source: Petrosyan (2014; 2010)

Petrosyan (2014) proposes depiction of magnitudes of CASP as per biodiversity concept which is viewed by Petrosyan (2015a) as educational involvements in *Table 2*.

Petrosyan (2015 b) provides an interesting approach as the finest management of indicators with the superior importance

on sustainable development and the complex estimation of encouraging progress according to nine (9) stepsas:

1. Producing aspects for generation of raw data;
2. Identifying goals for operation of produced aspects;
3. Imposing criteria for identified goals;

4. Classifying though principles of the imposed criteria;
5. Planning the process in the classified principles;
6. Reproducing the framework in the planned process;
7. Pertaining top-down and bottom-up approaches in the reproduced frameworks;
8. Applying pressure-state-response (PSR) frameworks in the pertained approaches;
9. Assembling the composite indicators in the assessments of supportive progresses.

Table 2. Depiction of Magnitudes of CASP as per Biodiversity Concept.

Stages	Class			Landscape
Magnitudes	Society	Economy	Nature	CASP
Education	Students	Professors	Scientists	Research
Work	Study	Teach	Innovate	Perform
Categories	Genes	Species	Ecosystems	Functions
Diversities	α	β	γ	Planetary
Fragstat Acronym	C_1	C_2	C_3	L_4
CASP Acronym	N_1	N_2	N_3	N_4
Vegetations	Sparse	Medium	Dense	Eco-zones

Source: Petrosyan (2015a; 2014)

3. Materials and Methods

3.1. Study Area

The region of South Caucasus is composed of the countries of Georgia, Armenia and Azerbaijan. The area is bordered by the Caspian Sea, the Caucasus Mountains with Russia and Turkey with Iran (Vener and Campana, 2010). Armenia (*Picture 4*) is located in the southern Caucasus and covers almost 10% of the Armenian upland (29,800 km²). Mainly, the military phase complies with theoretical and logic asymmetric

conflicts during 1992-1994 over Nagorno-Karabakh with specific factors led to victory (Deriglazova and Minasyan, 2011). Nowadays, Nagorno-Karabakh Republic, i.e. Artsakh, (*Picture 4*) is a smaller (4400 km²) autonomous area between Armenia and Azerbaijan. Armenia and Nagorno-Karabakh support diversity of landscapes with a range of species, due to their geographic position (Arakelyan and Parham, 2008). ARMSTAT (2015) represents eleven (11) Armenian areas and NKRSTAT (2015) presents seven (7) areas of Nagorno-Karabakh Republic in *Picture 4*.



Picture 4. Map of 18 areas of Armenia and Nagorno-Karabakh Republic.

3.2. Data Sets

Data sets are retrieved from ARMSTAT (2015) and NKRSTAT (2015) in co-ordination with eighteen (18) categories of *Table 1* as per eleven (11) Armenian and seven (7) Nagorno-Karabakh areas which are further addressed in

Petrosyan (2015a). Society (S) magnitude of Armenian CASP with six (6) chosen categories are represented in *Table 3* with maps of Armenian and Nagorn-Karabakh Marzes in *Pictures 5, 6, 7, 8, 9 & 10*.

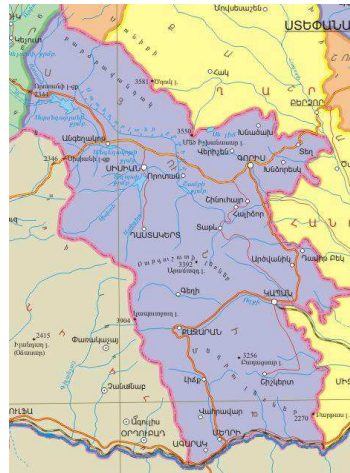
Table 3. Six (6) chosen categories of Society Magnitude of Armenian CASP.

Num	Armenian categories	Ministries	Areas / Pictures	Statistics
Society				
S ₁	Demography (Population)	Ministry of Territorial Administration and Emergency Situations http://www.mta.gov.am	Askeran Marz / <i>Picture 5</i> http://www.armeniapedia.org/wiki/Rediscovering_Armenia_Guidebook-_Askeran_Region http://www.nkr.am/en/	NKRSTAT (2015)
S ₂	Employment	Ministry of Labor and Social Affairs http://www.mlsa.am	Syunik Marz / <i>Picture 6</i> http://syunik.gov.am/	ARMSTAT (2015)
S ₃	Education	Ministry of Education and Science http://www.edu.am	Shirak Marz / <i>Picture 7</i> http://shirak.gov.am/	ARMSTAT (2015)
S ₄	Science	Ministry of Defense http://www.mil.am/	Lori Marz / <i>Picture 8</i> http://lori.gov.am/	ARMSTAT (2015)
S ₅	Economic Activities	National Assembly of Republic of Armenia http://parliament.am/	Yerevan Marz / <i>Picture 9</i> http://mta.gov.am/en/	ARMSTAT (2015)
S ₆	Transport and Communication	Ministry of Transport and Communication http://www.mtc.am	Vayots Dzor Marz / <i>Picture 10</i> http://vdzor.gov.am/ http://www.nkr.am/en/	ARMSTAT (2015)

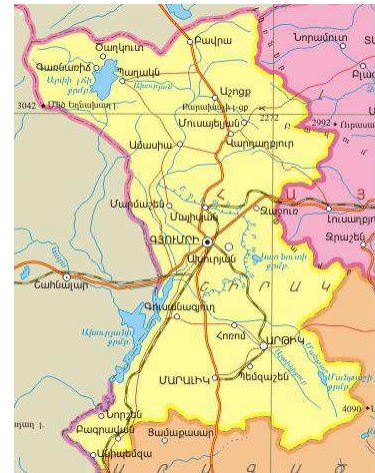
Source: Petrosyan (2015 a)



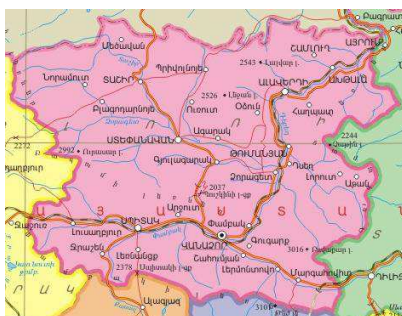
Picture 5. S₁ - Askeran Marz.



Picture 6. S₂ - Syunik Marz.



Picture 7. S₃ - Shirak Marz.



Picture 8. S₄ Lori Marz.



Picture 9. S₅ Yerevan Marz.



Picture 10. S₆ Vayots Dzor Marz.

3.3. Methodology

Composite Progressive Indicators (CPI) are represented through nine (9) steps in *Table 4*:

Table 4. Nine (9) steps for Composite Progressive Indicators (CPI).

Num	Nine (9) Steps	Ways
(1)	Aspects	Choice of Indicators
(2)	Aims	Reason for choice
(3)	Criteria	Means for reason
(4)	Principles	Values for means
(5)	Processes	Procedure as per values
(6)	Framework	Structure as per procedure
(7)	Top-down and bottom-up approaches	Implementation as per structure
(8)	Pressure-state-response (PSR) frameworks	Reaction as per implementation
(9)	Composite Progressive Indicators	Improvement as per reaction

Petrosyan (2015b) emphasizes on the choice of indicators with the application on Petrosyan (2014) work as per options of CASP indicators and with the crosscheck of the existent Greek and Armenian indicators appearances from articles of actively defined worldwide indicators. Armenian indicators has better fit to CASP indicators rather than to Greek ones for four (4) reasons:

- Armenian and Nagorno-Karabakh territories are in total of eighteen (18) Marzes, which are really related to CASP model with eighteen (18) categories as per three (3) Magnitudes of Society (S), Economy (E) and Nature (N) with the further emphases of proper geographic applications as main leaders of CASP.

- Armenian territories are approached for the whole country, whereas Greek case study is viewed only for the small area of Nea-Makri near to Marathon region.
- Greek areas consist of eleven (11) regions. CASP can be applied either on the Greek regions which can be expanded up to eighteen (18) territories or on the other European nearby country with seven (7) regions should be united to eleven (11) Greek territories to progress CASP.
- ARMSTAT (2015) and NKRSTAT (2015) has enhanced fit of categories to CASP rather than Hellenic statistical database existing in 2008 or 2009.

The current paper follows the next structures:

- Correspondence of CASP indicators as per number of authors with ARMSTAT (2015) and NKRSTAT (2015) indicators;
- Computation of extracted CASP indicators as per number of authors with ARMSTAT (2015) and NKRSTAT (2015) indicators;
- Representation of extracted CASP indicators as per number of authors with ARMSTAT (2015) and NKRSTAT (2015) indicators;
- Selection of three (3) main ARMSTAT (2015) and NKRSTAT (2015) indicators as per appearance in literature review with corresponding indicators.

4. Results

Indicators are the main data references to correspond existing Armenian indicators in *Tables 5, 6, 7, 8, 9 & 10* with the defined Society (S) Magnitude of CASP indicators as per book of Petrosyan (2014).

Table 5. Correspondence of S_1 - ARMNKR indicators with defined CASP indicators.

CASP			ARMNKR	
No.	Indicator	# of authors	No.	Stat Data
1.	Residency changes or density	22	1.	Population size
			2.	Urban population
			3.	Rural population
			4.	Life expectancy at birth
2.	Birth rate	3	5.	Number of live children of third and more order of birth
			6.	Average age of mother at child's birth
			7.	Average age of mother at first child's birth
3.	Density of residency	5	8.	Population of region centers of Nagorno-Karabakh Republic
			9.	Population of Nagorno-Karabakh Republic by regions
			10.	Marriages
4.	Marriages & homes	2	11.	Average age of getting married
			12.	Divorces
5.	Migratory balance	3	13.	Migration of population
			14.	Migration by age groups
6.	Demographic change	1	15.	Fertility rates in urban settlements
7.	Ratio of males to females	2	16.	Population distribution by sex and age
8.	Productiveness	2	17.	Natural growth of population
9.	Human resources	3	18.	Fertility rates in rural areas
10.	Nationalized foreign residents	1	19.	Migration by sex and age
11.	Positive empowerment	4	20.	Mechanical growth of population

Table 6. Correspondence of S_2 - ARMNKR indicators with defined CASP indicators.

CASP		# of authors	ARMNKR	
No.	Indicator		No.	Stat Data
1.	Performance	4	1.	Labour resources by education
2.	Diversity: in system as actors	4	2.	Economic activity rate by age
3.	Employment	3	3.	Labour resources of the republic of Armenia
4.	Equity of intra- and inter- gene-rations	4	4.	Employed population by age
5.	Gender equity	3	5.	Labour resources by age
6.	Personal versus society preference	3	6.	Employed population by public and non-public sectors of economy
7.	Society incorporation	3	7.	Employed population by types of economic activity and sectors
8.	Society programs	2	8.	Job placement of job seekers
9.	Existence of basic material needs	3	9.	Employed population by sectors of economy
			10.	Employed women by types of economic activity
			11.	Employed men by types of economic activity
			12.	Unemployed population by age
10.	Integration versus segregation	5	13.	Unemployed population by education
			14.	Unemployment rate by age
			15.	Unemployment rate by education
			16.	Officially registered unemployed by sex, age and education
			17.	Officially registered unemployed by sex
11.	Well-being of planetary communities	5	18.	Economic activity rate by education
12.	Opportunities for entertainments	3	19.	Employed population by status in employment
13.	Affording capacity	2	20.	Employed population by education
14.	Riskiness rate	3	21.	Economically inactive population by age
			22.	Economically inactive population by education
15.	Acceptance	3	23.	Employed population by sectors of activities and status in employment
16.	Self-esteem & self-reliance	4	24.	Employment rate by age
			25.	Employment rate by education
17.	Balance & centeredness	2	26.	Economically active population by age
18.	Quality of life	9	27.	Employed population by types of economic activity
19.	Equal opportunities & non-discrimination	2	28.	Informal employment by activities spheres and status in employment
			29.	Composition of officially registered unemployed
20.	Stress	1	30.	Officially registered unemployed by duration of unemployment
			31.	Officially registered unemployed in rural areas
21.	Security	7	32.	Officially demand in labour force submitted by employers
22.	Personal gratification	6	33.	Employed population by agricultural and non-agricultural activities
23.	Prosperous future	3	34.	Economically active population by education
24.	Precautionary principle	2	35.	Employed population by groups of economic activities

Table 7. Correspondence of S_3 - ARMNKR indicators with defined CASP indicators.

CASP		# of authors	ARMNKR	
No.	Indicator		No.	Stat Data
1.	No. of progressive plans & agendas	5	1.	Organizations provided second stage educational program of higher education
2.	No of scientists and engineers in R&D -research	3	2.	Number of teaching staff of higher educational institutions
3.	Scientific paradigm & theories	4	3.	Main indicators of education
4.	Education supported by governments	8	4.	Higher educational institutions by types of training (the first stage)
5.	Experience	2	5.	General education schools according to the level of implementing education programs
6.	Farseeing learning	3	6.	Shifts of studies in general education schools
7.	Ranking of schools	2	7.	Middle vocational educational institutions by types of training
			8.	Schools of general education
			9.	Graduates of general education schools
			10.	Pre-school institutions
			11.	Number of pupils in general education schools by the language of training
8.	School enrolment rate	1	12.	Number of teachers of preliminary (vocational) education institutions
			13.	Number of teachers of middle vocational educational institutions
			14.	Enrolment in the preliminary (vocational) education institutions by specialty groups
			15.	Enrolment in the middle vocational educational institutions by specialty groups
9.	Thinking	1	16.	Enrolment in the higher educational institutions by specialty groups (the first stage)
10.	Prosperity	2	17.	Production of books and brochures, magazines and newspapers
11.	No. of libraries	1	18.	Libraries
			19.	Main indicators of libraries' activity
12.	Effective monitors	4	20.	Number of foreign students in higher educational institutions of RA (the first stage)
13.	Environmental study program	7	21.	Number of teachers and students in the schools of general education
14.	Visiting area	3	22.	Museums
			23.	Theatres

Table 8. Correspondence of S_4 - ARMNKR indicators with defined CASP indicators.

CASP		# of authors	ARMNKR	
No.	Indicator		No.	Stat Data
1.	No. of progressive plans & agendas	5	1.	Domestic costs for research and development
2.	No of scientists and engineers in R&D	3	2.	Number of organizations engaged in research and development
3.	Scientific paradigm & theories	4	3.	Enrolment, admission and graduation of post-graduates
4.	Science	4	4.	Volume of scientific and technical works
5.	Prosperity	2		
6.	Creativity, innovation & inspiration	3	5.	Performance of scientific- and-technical works
7.	Qualifications	2		
8.	Fair & effective decision-making (DM)	4	6.	Number of employees of organizations engaged in scientific researches and developments
9.	Computers & Internet	1		
	Effective monitors		7.	Enrolment, admission and graduation of post-graduates by science fields
10.	Information & technology	6		

Table 9. Correspondence of S_5 - ARMNKR indicators with defined CASP indicators.

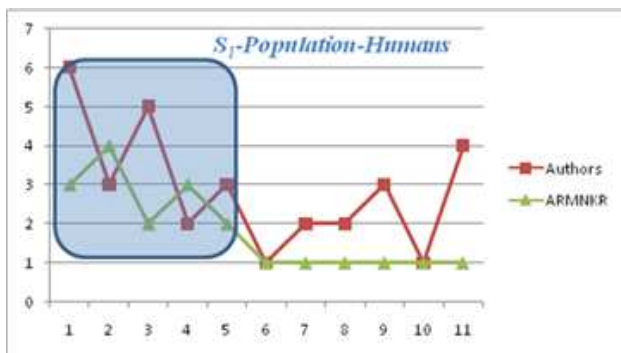
CASP		# of authors	ARMNKR	
No.	Indicator		No.	Stat Data
1.	Imports & exports	3	1.	Exports and imports of the Republic of Armenia by groups of goods by CIS countries and other countries of world
			2.	Structure export and import of RA
			3.	Export and import of RA by countries
2.	Market activities	5	4.	Share of main trade partners - exports of RA
			5.	Share of main trade partners - imports of RA
			6.	balance of payments of the RA
			7.	International investment position of RA
			8.	Gross external debt & assets positions of RA
3.	Investment	11	9.	Inflows and stocks of foreign total investment by countries in RA
			10.	Inflows and stocks of foreign direct investment (FDI) by countries in RA
			11.	Inflows and stocks of foreign total investment by type of activity of RA
			12.	Inflows and stocks of foreign direct investment by type of activity of RA

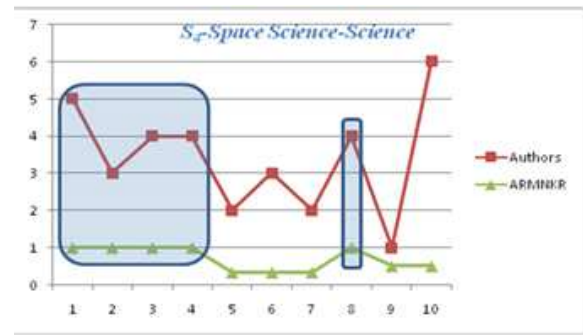
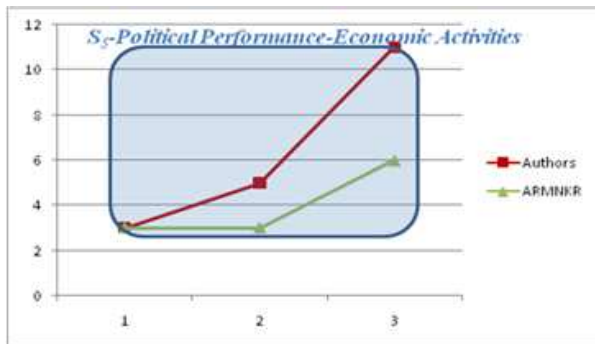
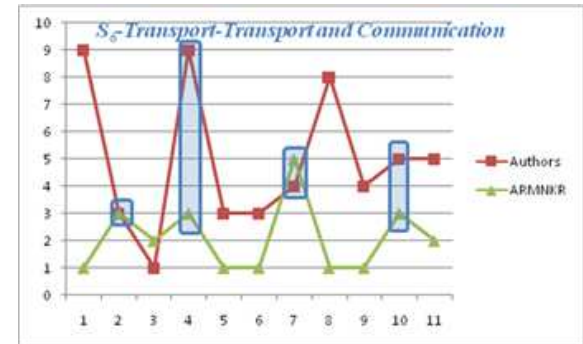
Table 10. Correspondence of S_6 - ARMNKR indicators with defined CASP indicators.

CASP			ARMNKR	
No.	Indicator	# of authors	No.	Stat Data
1.	Governmental transport services	9	1.	Main indicators of general purpose transport
			2.	Share of cargo transportation by separate types in total volume of cargo transportation
2.	No. of cars	3	3.	Share of cargo turnover by separate types of transport in total volume of cargo turnover
			4.	Indicators of taxi work
			5.	Share of passenger transportation by separate types of transport in total volume of passenger transportation
3.	Pedestrian areas	1	6.	Share of passenger turnover by separate types of transport in total volume of passenger turnover
			7.	Share of exported, imported and intra-republican freights transportation by types of general purpose transport
4.	Governmental transport coverage	9	8.	Shipment by types by general purpose railway transport
			9.	Share of shipments by types by general purpose railway transport
5.	Motorization rate	3	10.	Revenues from the auxiliary and subsidiary transport activity
6.	Accident rate	3	11.	Traffic accidents
			12.	Main indicators of communication
			13.	Revenues from communication services
7.	Communication & mobilization	4	14.	Fixed assets in the sphere of communication organizations
			15.	Density of communication ways on the territory of the republic
			16.	Operational length of communication ways
8.	Presence of roads	8	17.	Length of general purpose public roads by type of surface
9.	Service provision	4	18.	Availability of fixed assets in post and courier organizations
			19.	Revenues and expenditures from passenger transportation
10.	Travel distance	5	20.	Revenues and expenditures from freight transportation
			21.	Total revenues and expenditures from passenger transportation
			22.	Indicators of post and courier activities
11.	Infrastructure	5	23.	Length of general purpose public roads of intergovernmental, republican and local importance

5. Discussions

Pictures 11, 12, 13, 14, 15 & 16 are the representations of Extracted CASP Indicators for Society (S) Magnitude as per number of authors with ARMSTAT (2015) and NKRSTAT (2015) Indicators.

**Picture 11.** S_1 .**Picture 12.** S_2 .

Picture 13. S₃Picture 14. S₄Picture 15. S₅Picture 16. S₆

The current paper is dedicated to show the most important ARMSTAT (2015) or NKRSTAT (2015) indicators as per appearance of Extracted CASP indicators with ARMSTAT (2015) or NKRSTAT (2015) according to authors opinion in the literature review. Three (3) main indicators are as per each category of Society (S) Magnitude with numbers of appearances in the sequence for ARMSTAT (2015) or NKRSTAT (2015) indicators as:

- (1) S₁ - Demography - Humans:
 1. Residency changes or density
 2. Birth rate
 4. Marriages & homes
- (2) S₂ - Society Concerns - Employment
 10. Integration versus segregation
 14. Riskiness rate
 16. Self-esteem & self-reliance
- (3) S₃ - Knowledge in Practice - Education
 6. Farseeing learning
 7. Ranking of schools
 14. Visiting area

- (4) S₄ - Space Science - Science
 1. No. of progressive plans & agendas
 3. Scientific paradigm & theories
 8. Fair & effective decision-making (DM)
- (5) S₅ - Political Performance - Economic Activities
 1. Imports & exports
 2. Market activities
 3. Investment
- (6) S₆ - Transport - Transport and Communication
 4. Governmental transport coverage
 7. Communication & mobilization
 10. Travel distance

6. Actualization

The illustration of CASP indicators is provided through extracted CASP indicators as per number of authors with ARMSTAT (2015) and NKRSTAT (2015) indicators in Table 11.

Table 11. Indicators representation per authors.

Category	Num of Indicators			Num of Authors
	CASP	Extracted CASP	ARM-NKR Stat	
S ₁	13	11	20	30
S ₂	45	24	35	35
S ₃	20	14	23	24
S ₄	32	10	7	16
S ₅	16	3	12	27
S ₆	13	11	23	25

Petrosyan (2015a) presents the Approximate Main Coordinate Proportion (AMCP) in *Picture 17* and Approximate iNDicative Coordinate Proportion (ANCP) in *Picture 18* concepts with the following computations:

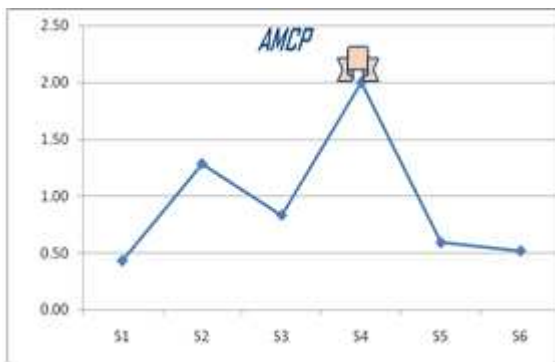
$$AMCP = \frac{\text{Num CASP Indicators}}{\text{Num Authors}}$$

$$ANCP = \frac{\text{Num CASP Indicators}}{\text{Num ARMSTAT Indicators}}$$

The current paper examines the Approximate Main Difference in Coordinate Proportion (AMDCP) in *Picture 19* and Approximate iNDicative Difference in Coordinate Proportion (ANDCP) in *Picture 20* concepts with the following computations:

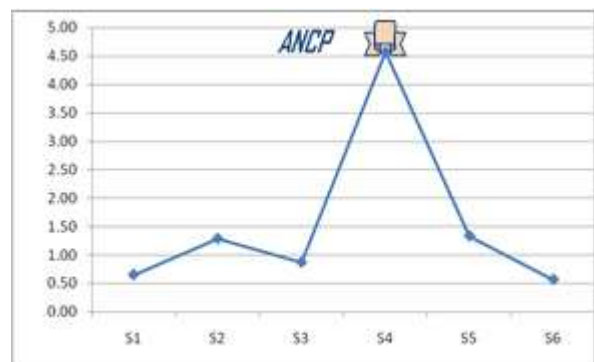
$$AMDCP = \frac{\text{Num CASP Indicators} - \text{Num Extracted CASP Indicators}}{\text{Num Authors}}$$

$$ANDCP = \frac{\text{Num CASP Indicators} - \text{Num Extracted CASP Indicators}}{\text{Num ARMSTAT Indicators}}$$

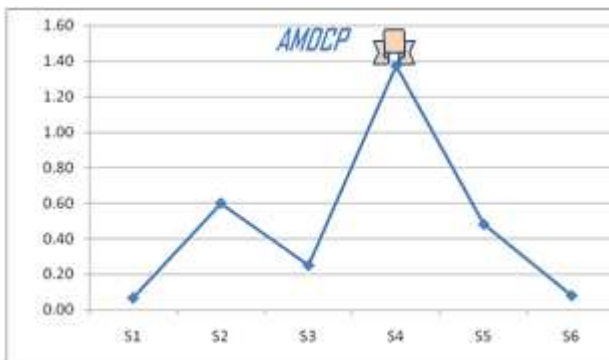


Petrosyan (2015a)

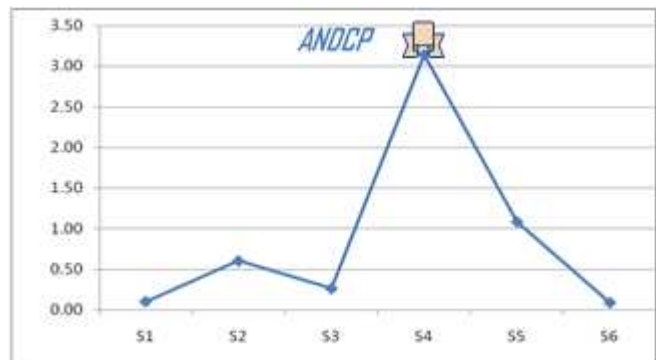
Picture 17. AMCP.



Picture 18. ANCP.



Picture 19. AMDCP.



Picture 20. ANDCP.

7. Conclusion

80% of ARMSTAT (2015) with NKRSTAT (2015) has a fit to CASP indicators for Society (S) Magnitude. S₂ and S₅ categories have an approximate fit of ARMSTAT (2015) with NKRSTAT (2015) indicators to CASP indicators for Society (S) Magnitude. AMCP & AMDCP curves have almost the similar presentation. ANCP & ANDCP have similar curves as well. AMCP coincides with ANCP in S₄ category. AMDCP

match up with ANDCP in S₄ category. S₄ category stands for Space Science as a concept of Geographic Information Systems (GIS) and Remote Sensing (RS) application whereas the concept of satellite with taking pictures of the earth is represented in *Picture 21*.

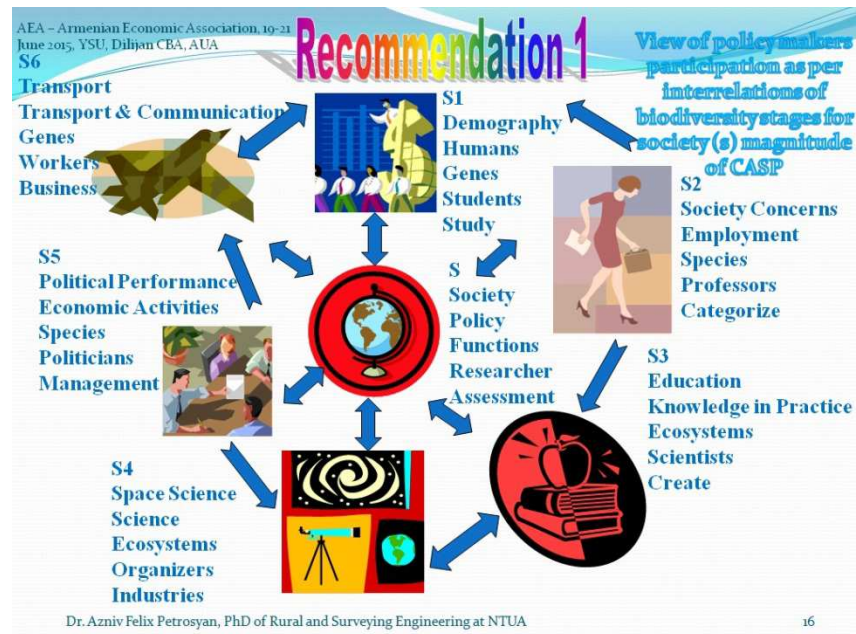
28% is computed as 1/3 of mid value of Society, Economy and Environment (SEN) in percentages within the Armenian and Nagorno-Karabakh, i.e. Artsakh, regions for the Society (S) Magnitude of CASP.



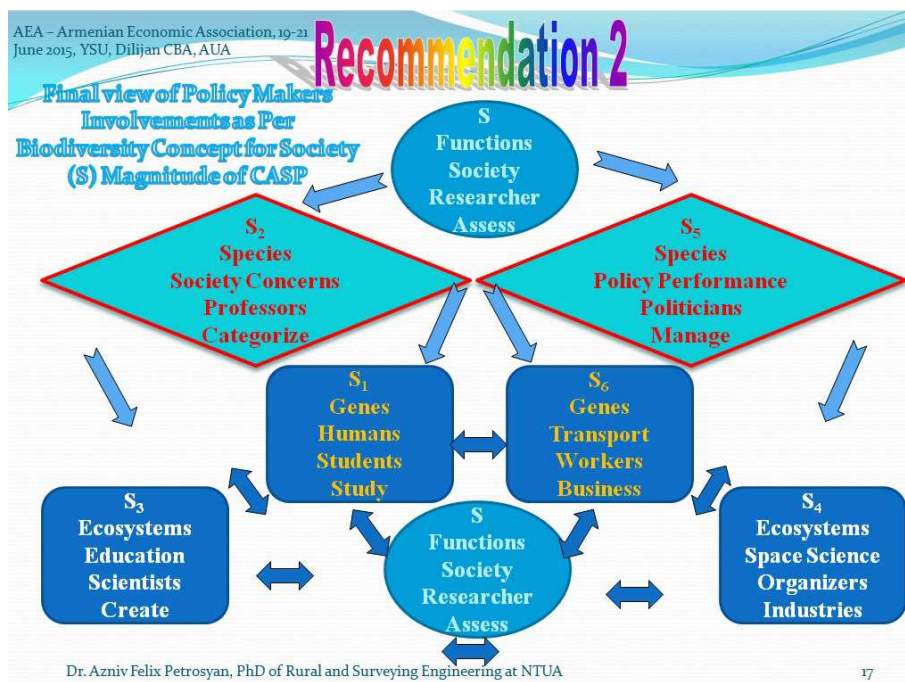
Picture 21. Space Science (S_4) in Remote Sensing (RS) Concept.

Recommendation

Main recommendation is to use the concept of Biodiversity in terms of Science, Industries and Politics in the Armenian and Nagorno-Karabakh, i.e. Artsakh, regions for the Society (S) Magnitude of CASP. View of policy makers participation as per interrelations of biodiversity stages is depicted in Picture 22 for Society (S) magnitude of CASP.



Picture 22. View of policy makers participation as per interrelations of biodiversity stages for Society (S) magnitude of CASP.



Picture 23. Final view of policy makers involvements as per biodiversity concept for Society (S) magnitude of CASP.

Political Economy should play a key role in the assessment of CASP through biodiversity concept. Politicians as policy makers with professors as organizers plays an important role to manage through categorization of the whole Society (S) magnitude of CASP. Space science as a part of whole science should emphasize on the science of transportation through means of communication and knowledge. Scientific education should correspond to a key role of humans to lead the science through industries and innovations. *Picture 23* represents the final view of CASP as per biodiversity concept with political economy and educative involvements as a function of policy makers for the Society (S) magnitude of CASP.

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