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Polycentric settlement as a sustainable development strategy of Nepal: An empirical analysis

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Abstract

The present paper is an analysis of potential settlement locations for polycentric centers and their expected role in socio-cultural, economic, environment and transport network as well as spatial development patterns in the rural areas of Nepal. Using multi criteria decision analysis method and analytical hierarchy process (AHP) number of polycentric settlement centers were identified as the potential centers for socio-economic development settlement locations in a sustainable way. The empirical findings of the paper indicate the polycentric settlement centers not only promote agglomerative economies and facilitate economic growth; they also generate a disproportionate number of trips and promote transit ridership. These results provide empirical support for policies that need to promote such polycentric settlement (urban system) development in order to improve the livelihood of the rural population and also meet the national goal of peace, prosperity, and sustainable progress. Further, the findings of the paper suggest that polycentric settlement model as a sustainable development strategy requires careful coordination of regional and national level budgetary systems designed to balance development within a center's periphery. Based on these findings it is recommended that the development plan of the country has to encourage the concentration of economic and livelihood opportunities within superior settlement centers and encourage territorial development by promoting social innovation and cultural development of the centers as well as neighbors of the centers.

Introduction

The economic, spatial and mobility trends in Nepal point towards the inevitability of developed dense and compact human settlement in the countryside with a view to materialize the social innovation and cultural practices in the sphere of arts and creativity. To solve the local development problems in the context of rural areas, satisfaction of human needs, diffusion of skills and technology by activating local politics and policy making for valorization of territorial specify through democratic governance or democratization of local development is utmost in order to promote the practice of self-determination economy as people transform their livelihoods and lives by enlarging the power and competence base of

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localities. Polycentric centers growth process is considering as the engine of economic growth, social change and science and technological development in Nepalese context (NPC, 2015).

The inhabitants in the dispersed settlements in rural areas of Nepal show a distinct gradient in their living conditions largely governed by the degree to which they have access to resources, information and services. The high production oriented settlements with reliable access to markets and services are relatively densely clustered and seem to have progressed well due to high accessibility, agricultural intensification, and access to services and technologies. In contrast, there are many small settlements with only few houses that are not as fortunate to have these opportunities for progress. Most of such settlements have limited agricultural activities cultivating single crop and can normally be accessed by foot path. The predicament of present day Nepal is that a large number of populations still live in these scattered and isolated settlements. Physical inaccessibility have deprived them of the basic amenities such as adequate shelter, water supply, health services, education, information, and rescue and relief at the time of need (NPC, 2013). The Constitution of Nepal promulgated in 2015, Nepal is poised to move towards a federal system of governance which has significant implications for compact settlement as the process of urban growth and development. The constitution can be a guide to orient provincial and regional territorial development processes and associated investment decisions in the new federal structure of governance.

In Nepal, majority of the rural population living in scattered settlements in all three ecological regions where country does not reach minimum population thresholds to be effectively and efficiently provided with basic infrastructure, and social and economic services are including job opportunities. Due to the dispersed rural settlement patterns, the per capita costs for construction, operation and maintenance of basic infrastructure and other essential services are very high coupled with low economic returns (Fujita et.al, 1999; DUDBG, 2010). In the absence of basic life-sustaining services and economic opportunities in the rural areas, the population belonging to economically active age groups has been migrating temporarily or permanently to the urban centers of the country as well as outside the country in search for better services and facilities, and for employment a critical factor affecting rural development in Nepal. This calls for a new thinking or new paradigm shift in rural development approach and processes for providing better services and sustainable livelihood opportunities to the rural population. The national paper on compact settlement development (2003) designation of hierarchy of humans settlements standards (2004) noted that developing integrated compact settlements (ICS) or polycentric settlement for provision of basic services and livelihood opportunities along with the appropriate measures for protection of natural resources and environment could be a viable option and approach to initiate this new thinking, and could help raise the living standards of a majority of rural population.

The traditional mode of living sustained by the conventional economic activities in the remote rural and scattered settlements is no longer adequate to meet the rising needs and aspirations of the present day population, let alone that of the future generation. It becomes the prime responsibility of the state to provide the basic amenities to its citizens in an inclusive way. Irrespective of where they live, the citizens must be able to access clean water, education facility, health services, and opportunity for economic growth. They need access to opportunities for income by practicing economic activities of their choice. However, with the current pace of infrastructure development it would take long time before these remote and isolated settlements are provided with basic amenities; and until then they

will remain outside the purview of mainstream development. The ramification of road access to densely clustered settlements can be seen in the development of private sector providing education, health services, agro-vet services, and markets for farm produces. The compact as well as polycentric settlement seems to have advanced development by providing entry points for different stakeholders including the private sector wherever access to roads and services have been made available (Mac. Cllum et.al., 2008). However, the level of urbanization is still very low in Nepal. For the level of urbanization and to increase the urban growth there has to be an economic transformation in the productive sectors. Major economic sectors are required to modernize. For this, the main livelihood of Nepalese people, agriculture needs to be commercialized, agro-based and other natural resource based entrepreneurs has to be encouraged. The space economy has to be further articulated through the development of transport and communication and a context has to be created for meaningful economic exchange between different ecological regions of the country. There are enormous differences in the regional levels in terms of development and living standard. This can be addressed only through the realization of the productive potentials of different regions. At the same time the tendencies of a centralized urban process have to be countered not only to foster decentralized urban growth but also to avoid the problems that accompany primate and very large cities particularly in fragile mountain environments.

In above background, Ministry of Urban Development/ Department of Urban Development and Building Construction of Nepal has initiated to promote the compact settlement (polycentric centers) to reduce the disparity between urban and rural areas in terms of human needs, satisfaction, infrastructure development and providing social services as to the access to governance and government, increase in the transparency of public administration and empowerment of locals through horizontal information to enhance the local capacity as the breeding grounds of social innovation for economic dynamism (DUDBC, 2010). Within the framework of national urban development strategy of Nepal, spatial elements have been taken to account to establish functional interdependencies and emphasize synergies in the line with local needs, energy policy and sustainable mobility. The program has been expected to promote the integrated and multispectral approaches for a polycentric and balanced settlement cluster (polycentric centers) system and strengthening of the partnership between urban and rural areas which can overcome the outdated dualism between city and countryside (Nilsson, 2014). Regarding aforementioned policies issues, development challenges and new opportunities, the main aim of the paper is to identify the potential polycentric settlement centers and their role in facilitating socio-economic development and sustainable use of available resources in the rural areas of Nepal. The paper focused to review the literature on polycentric development as a regional development strategy to identify the potential polycentric settlement centers and describe how the identified polycentric centers can perform as the superior polycentric centers at the district level.

Methods

The present study analyses the intensity of the relationships between the components of the settlements systems. The analysis of the territorial capacity was conducted on the basis of six major aspects and their respective criteria: physical setting and geographical location, demographic size and attractiveness, economic power and competitiveness, resources capacity by means of services belonging to the superior tertiary sector, the number of neighboring settlements as the hinterland of polycentric centers as inferior rank from the

influence area, territorial cultural typicality and the perspectives of supporting the consolidation of the regional settlements system. Following the aggregation of these indicators, weighted value of the polycentric capacity was established to each selected settlement location. The impact of the economic opportunity has been analyzed by elaborating a database at the settlement level. In elaborating the polycentric settlement development, a special attention was given to the elaboration of a complexity scale for the polycentric structures, the degree of complexity ensuring the territorial systems a certain reaction to negative impulses from the level of supra systems, in the sense of a larger and larger attenuation, once the complexity of polycentric networks increased. This is based upon the development of some urban systems which represent engines of development for the subordinate urban and rural systems. Within the polycentric development centers, a special attention was given to highly disadvantaged areas, where it is necessary to constitute some growth poles able to structure the space functionality in an optimal way. On the basis of multi criteria analysis, there were identified the highly disadvantaged areas, within which settlements with a central role function were identified; these settlements must contribute to the propagation of development in these fragile geographical areas.

Considering national urban development strategy (2007) and offering latest and more popular multi criteria decision analysis method for development project selection, prioritization was made by applying the Analytical Hierarchy Process (AHP) technique to analyze the basic aspects and factors of polycentric settlement development and also calculate the weightage of each aspect and their indicators (Hossain, et.al, 2007; Saaty,1980). All the centers were examined with respect to their economic performance including measures of comparative basic and non-basic functions, economic and livelihood opportunities, employment density, resources availability and ecosystem services, cultural and social importance, occupational structure and employment growth followed by an examination of their performance as nodes in the national and regional transportation system including measures of trip origins and destinations and mode share. The average value of selected potential settlements was measured by using AHP to show their rank order (hierarchy) on the basis of functional performance of each selected settlements with a view to promote sustainable development at the state and regional scale (table 1a & b).

Table 1a: Polycentric Settlement Selection Indicators and Their Comparative Value

Aspects	Physical setting	Physical infrastructure	Economic and livelihood opportunity	Social development	Institutional development	Environmental aspects
Physical setting	1	3	2	2	3	2
Physical infrastructure	0.33	1	0.5	2	2	3
Economic and livelihood opportunity	0.5	2	1	2	2	2
Social development	0.5	0.5	0.5	1	2	2
Institutional development	0.33	0.5	0.5	0.5	1	0.5
Environmental aspects	0.5	0.33	0.5	0.5	2	1

Table 1b: Comparative Matrix of Indicators with Their Weighted Value

Aspects	Indicators							
	Physical setting	Physical infrastructure	Economic and livelihood opportunity	Social development	Institutional development	Environmental aspects	Average value	Total weighted value
Physical setting	0.32	0.41	0.40	0.25	0.25	0.19	0.30	30
Physical infrastructure	0.11	0.14	0.10	0.25	0.17	0.29	0.17	17
Economic and livelihood opportunity	0.16	0.27	0.20	0.25	0.17	0.19	0.21	21
Social development	0.16	0.07	0.10	0.13	0.17	0.19	0.13	13
Institutional development	0.11	0.07	0.10	0.06	0.08	0.05	0.08	8
Environmental aspects	0.16	0.05	0.10	0.06	0.17	0.10	0.10	10

Source: Hossain et. al., 2007

Results

Types and forms of settlement

It seems that the concentration of settlement is related to several factors like landform, soil types, and availability of natural resources, accessibility and social integration. These factors have varying degree of effects on types and forms of settlements in rural area of Nepal. Topographical features, climate, agricultural land, sources of food, fodder and fuel, and connectivity have significant role to determine the size, types and forms of rural settlement in Nepal. Using national concept paper on compact settlements 2061 B.S. and satellite image the number, types and forms of settlements have been identified from selected districts (table 2abcd).

Table 2: Settlement Types and Structure

a) Okhaldhunga District

Settlement types	Settlement structure			Total	Percentage
	Block	Linear	Others		
Dispersed/scattered				51	5.05
Agglomerate	468	446	3	917	90.88
Compact	19	22		41	4.06
Total	487	468	3	1009	
Percentage	50.84	48.85	0.31		

b) Sindhuli District

Settlement types	Settlement structure			Total	Percentage
	Block	Linear	Others		
Dispersed/scattered				2	0.14
Agglomerate	136	1186		1322	91.55
Compact	46	74		120	8.31
Total	182	1260		1444	
Percentage	12.62	87.38			

c) Baglung District

Settlement types	Settlement structure			Total	Percentage
	Block	Linear	Others		
Dispersed/scattered			357	357	13.29
Agglomerate	1068	1161		2229	82.95
Compact	83	18		101	3.76
Total	1151	1179	357	2687	
Percentage	42.84	43.88	13.29		

d) Rolpa District

Settlement types	Settlement structure			Total	Percentage
	Block	Linear	Others		
Dispersed/scattered				4	0.33
Agglomerate	10	1165		1175	96.87
Compact	14	20		34	2.80
Total	24	1185		1213	
Percentage	1.99	98.01			

Source: Field Study, 2015 and Google Earth, 2015

It is evident from the annex 2 (abcd) the total number of settlement are 1009, 1444, 2687 and 1213 in Okhaldhunga, Sindhuli, Baglung and Rolpa respectively. The proportion of agglomerate settlement found high (90%) in Okhaldhunga as compared the compact settlement (4.06%). Regarding the settlement structure, more than 50 percent settlements are in block structure and around 48 percent settlements are in linear form. Similarly, 91.55 percent of settlements of Sindhuli district observed agglomerate and 8.31 percent compact. While the block type of settlement found 12.62 percent and 87.38 percent linear. In case of Baglung district, around 13 percent settlements found dispersed and scattered, 82.95 percent agglomerate and only 3.76 percent compact. The proportion of block and linear settlements found 42.84 percent and 43.88 percent respectively. More than 13 percent settlements observed others (isolated/scatted). Whereas the agglomerate settlement found 96.87percent in Rolpa district and the percentage of compact settlement were only 2.80. Similarly, block type of settlement observed 1.99 percent and the linear type of settlement 98.01percent.

Settlement Hierarchy

The position and rank are important for creating a hierarchy of space in dwellings and settlements. Thus, the spatial hierarchy of selected settlement locations has been determined using multi criteria decision making methods and analytical hierarchy process. The average weighted value of each settlement was calculated from each indicator and the rank level prepared at the district level for promoting as polycentric settlement centers according their rank. The hierarchic order of the selected settlements of selected district has been presented in (Table-3abcd).

Annex 3: Settlement Hierarchy

a) Okhaldhunga District

Rank	Name	Physical setting	Physical infrastructure	Economic development	Social development	Institutional development	Environment asset	Total weight
1	Rumjatar	28.28	13.11	18.81	10.99	6.32	5.08	82.59
2	Rampur, Tallotar	23.19	13.78	19.33	10	6.12	9.24	81.66
3	Jarayotar	20.95	12.82	14.98	6.76	1.9	6.73	64.14
4	Majuwa	15.66	12.82	12.27	6.54	2.74	6.16	56.19
5	Bilandu	19.5	6.72	14.89	3.32	3.7	5.28	53.41
6	Dobre, Khiji Phalante	16.35	7.36	12.62	4.21	4.94	6.09	51.57
7	Kaphalbote, Ramche, TharpudandaDolphu	15.06	7.4	13.06	4.71	4.72	6.41	51.36
8	Manebhanjang, Tilpungdanda	9.18	10.36	10.26	8.82	7.38	5.36	51.36
9	Hulakechaur	11.65	7.99	14.18	6.13	4.72	5.32	49.99
10	Harkapur	18.21	13.69	11.11	2.45	1.93	2.53	49.92
11	Bigutar	15.66	10.63	9.29	7.83	1.42	4.2	49.03
12	Rayale, Chyanam	12.15	10.03	11.09	6.5	2.52	5.75	48.04
13	Jyamire, Khodumpa	9.97	8.96	11.86	6.45	4.14	6.41	47.79
14	Gurungtol	8.06	12.02	11.81	5.05	4.72	5.89	47.55
15	Bitlab	11.98	9.43	12.2	4.1	3.18	4.71	45.6
16	Mansitol	11.73	7.75	12.28	4.49	2.74	4.71	43.7
17	Unbhu	9.48	8.79	9.58	6.87	4.14	4.71	43.57
18	Taksa	15.66	9.05	9.53	3.37	0.83	4.08	42.52
19	Udyapur	9.98	8.19	10.93	5.08	2.52	5.75	42.45
20	Dolphu	15.66	9.05	9.66	3.16	0.8	4.08	42.41
21	Pakhe	11.4	7.18	12.5	3.04	1.93	5.75	41.8
22	Rageni, Gairagaun	6.37	10.34	9.44	7.75	2.15	5.37	41.42
23	Bhogteni, Palapu	12.55	3.5	8.88	6.4	4.94	3.94	40.21
24	Harkapur	13.98	6.07	7.75	3.75	2.52	6.09	40.16
25	Narkate	9.18	9.33	9.7	3.41	4.72	3.55	39.89
26	Pangkhu	9.98	9.79	11.19	1.98	1.93	4.71	39.58
27	Tallo Bhadaure	11.75	8.7	9.58	3.04	1.93	3.94	38.94
28	Gairigaun, Mathillo Richuwa	10.28	8.19	9.17	3.69	2.59	4.71	38.63
29	Rampur, Kundule, Bakhre	9.98	7.26	10.65	3.04	2.74	4.71	38.38
30	Parthok	10.3	4.38	10.35	4.9	1.93	4.71	36.57
31	Balkhu	14.23	2.66	8.71	4.26	3.25	2.89	36
32	Ahale, Dhuseni	9.18	7.12	4.03	7.06	2.52	4.18	34.09

b) Sindhuli District

Rank	Name	Physical setting	Physical infrastructure	Economic development	Social development	Institutional development	Environment asset	Total weight
1	Dhamile, Chhap, Mahesota	21.84	14.45	21	9.51	6.1	6.16	79.06
2	Jitpur, Dudhauli, Ladabhir,Dadagaun	21.84	14.16	18.81	12	7.1	4.81	78.72
3	Boretar, Ramtar, Mulkot	24.29	14.47	13.12	10.41	6.04	3.03	71.36
4	Chakmake	19.5	9.29	19.33	11.56	4.9	3.66	68.24
5	Ratanpur, Nayatol, Basaniya, Bhaluwahi	21.84	12.8	15.45	8.76	3.92	2.67	65.44
6	Haitar	18.21	10.6	17.03	5.26	3.21	6.09	60.4
7	Chaurahi, Dandi	19.5	11.53	15.51	7.19	1.34	3.68	58.75

8	Gwaltar	16.6	15.42	9.94	6.42	4.14	4.33	56.85
9	Jinakhu	18.21	5.67	14.96	8.18	2.77	5.05	54.84
10	Lamidanda, Nagi	17.12	10.41	11.33	4.74	3.21	5.37	52.18
11	Simpur	16.86	9.85	13.49	5.26	2.77	2.67	50.9
12	Pachgachhi, Shreepur	16.55	7.21	10.32	5.67	0.83	2.15	42.73
13	Chandanpur	16.22	8.08	7.59	4.74	3.21	2.15	41.99
14	Simalchaur, Dumja, Sadhimajuwa	12.22	10.9	7.39	4.74	3.21	3.03	41.49
15	Khoklaing	15.41	7.12	7.58	4.74	2.59	3.56	41
16	Khangsang	11.57	10.93	7.58	3.96	3.21	3.03	40.28
17	Phalame	12.06	4.51	9.59	3.03	2.15	5.37	36.71
18	Muldandai	6.11	6.03	8.37	2.47	2.15	5.37	30.5
19	Patyeni	6.37	4.97	6.05	2.06	2.15	4.33	25.93

c) Baglung District

Rank	Name	Physical setting	Physical infrastructure	Economic development	Social development	Institutional development	Environment asset	Total weight
1	Balewa, Narayansthan	24.53	13.11	13.18	8.76	6.1	6.09	71.77
2	Khara Bajar	20.95	15.72	17.78	3.44	3	6.55	67.44
3	Majuwa Phant	19.34	15.35	16.83	6.03	4	5.5	67.05
4	Angkhet	18.21	16.27	15.05	3.94	4	5.51	62.98
5	Nwara	15.66	17	13.52	9.27	2.4	4.46	62.31
6	Harichaur	17.41	11.54	15.35	5.56	6.1	5.37	61.33
7	Pokhara Bihu, Lisepani & Jukepani	12.22	14.8	14.4	7.24	4	6.03	58.69
8	Kushmisera	15.82	11.48	13.94	7.42	5.2	3.03	56.89
9	Nauthargaun, Bobang, Thakali Bhati, Masalgaun & Serabang	20.15	6.44	13.76	7.32	1	6.55	55.22
10	Nisi	20.95	9.27	10.18	5.73	2.9	2.51	51.54
11	Lekhani, Kurlimare & Upallotar	11.56	10.75	11.86	8.99	4	4.28	51.44
12	Nayan Bajar	15.66	9.15	11.98	4.42	2.9	5.37	49.48
13	Chhamri	7.89	12.21	14.84	5.53	2.4	5.37	48.24
14	Taman	12.78	8.31	12.82	4.19	2.4	3.03	43.53
15	Sormani	9.96	9.71	10.48	2.55	1	4.28	37.98
16	Chautara & Dipdanda	9.98	6.25	8.48	3.66	1.9	4.59	34.86

d) Rolpa District

Rank	Name	Physical setting	Physical infrastructure	Economic development	Social development	Institutional development	Environment asset	Total weight
1	Madichaur	23.15	14.09	17.53	12.35	4.9	3.66	75.68
2	Nerpa	24.27	10.75	17.19	8.72	7	7.41	75.34
3	Khungrichaur, Dharapani	21.86	15.35	16.25	10.57	5.4	4.84	74.27
4	Jailwang	19.61	8.12	18.17	8.26	4.4	4.84	63.4
5	Raibang	19.84	11.17	15.17	7.99	4.9	3.13	62.2
6	Sarechaur, Holeri, Chaukhe	12.66	8.99	11.98	12.58	7	7.1	60.31

7	Upallothar	13.18	14.56	11.32	7.6	4.9	6.09	57.65
8	Simpani, Ramjali	17.98	5.36	12.53	6.87	4	8.45	55.19
9	Lingdung,Chhap, Panchmore	21.29	7.33	10.25	6.87	3	4.84	53.58
10	Ghartigaun	11.98	9.09	12.27	9.05	5.2	4.7	52.29
11	Madure,Hulaki danda	14.9	9.05	7.1	8.9	3	4.84	47.79
12	Khumel	15.24	6.87	8.1	8.72	3.4	4.33	46.66
13	Maichanne	13.57	5.99	7.89	4.69	1.2	5.37	38.71
14	Gothikholagaun	13.18	8.19	7.33	4.13	1.8	3.56	38.19
15	Tebang, Raj Pokhara	13.18	3.83	6.23	7.78	3.4	3.03	37.45
16	Namja	10.2	5.5	4.66	2.43	1.8	3.03	27.62

Field Study, 2015, personal computation by adopting AHP method

Out of the total number of settlement (1009) that identified using satellite image and AHP methods 32 potential polycentric settlement in Okhaldhunga district have been selected from their respective value and rank order. Among them top ten settlements were field visited and each of the calculated value was verified and final rank order of top ten settlements was determined. The then first rank order Rumjatar (82.59) was recommended to promote as the polycentric settlement in Okhaldhunga district. Similarly, in Sindhuli district out of total number of settlement (1444) 19 potential polycentric settlement locations were identified. Top ten settlements were field visited to verify the calculated value of each indicator that had taken into consideration. From the final rank order, Dhamile, Chhap Mahesopta (79.06) was selected as to develop the polycentric settlement in Sindhuli district. While 2687 settlements were identified using satellite image in Baglung district and 16 potential polycentric settlement locations were chose on the basis of calculated weight from available information that assembled through secondary sources. Top ten from the rank order settlement were field visited to verify the calculated value of each indicator. Based on verified weight of the calculated value Balewa Narayansthan (71.77) was suggested to develop as the polycentric settlement in Baglung district . Likewise Madichaur (75.68) was identified as the top rank potential polycentric settlement location in Rolpa district where 1213 settlement were identified and 16 potential settlements had undertaken into consideration and top ten settlements were field visited.

Discussion

Paradigm shift from mono centric to polycentric development approaches

The territorial (regional) development agenda establishes new coordinates of the spatial development with the main purpose to create competitive multi functional centers that are evenly distributed on countryside with no differences and functional flaws between the centre and periphery, a system of human settlements classified by their development potential, interconnected in functional networks. The development of human settlements formed by development poles is one of the major challenges of the decision factors and an interdisciplinary research theme for the scientific world. The concept of polycentrism is the tendency of population and economic activities to concentrate themselves in urban nuclei which have the capacity to exert their influence upon the entire urban structure and upon the areas around them. Kaanap (2012) viewed that polycentric development may contribute to the balanced economic development and to the decrease of territorial disparities from the regional perspective. The urban network to be the spine of a territorial system, as

polycentrism ensures the transmission of information which is indispensable for the efficient development at the entire territorial system's level. The need to support polycentric system networks as main principle in the regional development is sustained by the results of the detailed analyses of territorial systems, which emphasized interesting evolutions of the development coefficient as a result of the impulses from the central level. Although important sums from the state budget were allocated, these areas reacted in a different manner, developed areas became more developed, and poor areas remained as accentuation of omit economic decline. It was noticed that certain areas with significant economic unbalances, situated nearby urban centers with a significant economic dynamic, recorded growth due to the development of some territorial complementarities by means of the relationships' enhancement with the development poles. Profoundly disadvantaged areas proved their incapacity to amplify the effects of financial impulses, whereas developed areas registered a continuous development, regardless of the evolutions of the central decisional chain. This different capacity to react to the same decisional impulse advances several questions regarding the efficiency of the regional development strategies applied in Nepalese context to the present. The proposed polycentric settlement development approach comprises a network of development poles, classified according to their capacity to transmit information indispensable for development within the settlements system it subordinates. The relationships between these development poles are complex, depending on the territorial complementarities which are in a permanent dynamic. The principle of complementarities between development poles is analyzed in several studies which is difficult to predict evolution of the relationships between development poles from different levels and from the same level. The researchers conducted for the elaboration of polycentric development strategy emphasized the special importance of the enterprise sector within the economic dynamic of development poles, action which is analyzed in many academic approaches.

Now the economic crisis spread at the world economy level has hard to predict implications, due to the transmission speed by means of the more and more numerous synapses which appeared together with the globalization process. At the territorial systems' level, the economic crisis is displayed as negative impulses, which contribute to the modification of the territorial dynamic with a negative sense, producing chaos or major unbalances at the level of some systems or subsystems. Negative impulses from the level of suprasystems leave their mark firstly on the demographic dynamic. Thus, the spatial structure of human settlements has been a topic of considerable and continuing interest since the seminal works of Christaller to present. The reasons for such sustained interest vary. Some interest is derived from concerns for economic productivity and grounded in the notion that economic efficiency can be enhanced through the efficient spatial arrangement of socio-economic activity. Some interest stems from concerns for social justice and grounded in the notion that the spatial arrangement of demographic groups reflects and determines social structure and equity. The interest of others is founded in support of environmental preservation and grounded in the notion that the spatial arrangement of human activity can impact the quality and integrity of the natural environment. At present, all of these concerns have become subsumed in the notion of sustainable development, frequently defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland, 1987).

Peptenatu, et. el., (2012) said that the elaboration of the polycentric development strategy is based on the human settlements' classification depending on their polarization capacity and the designing of a polycentric network, able to ensure the territorial complexity necessary to the attenuation of negative impulses from the suprasystems' level. The world

economic crisis may be considered the most powerful negative impulse after the Second World War, generating major disfunctionalities at the level of fragile territorial systems. The elaboration of some specific strategies, able to take into account the new challenges given by the global world, is an important preoccupation of the decision factors in order to increase territorial competitiveness.

Understanding the polycentric system and the way of functioning is conditioned by knowing the theoretical framework which constituted the basis of the territorial development approach based on the growth poles theory. Polycentrism is a concept based on the idea of promoting several decision centers. In territory planning, the concept assumes a complex approach to social innovation and territorial development, using defined devices, classified depending on their capacity to spread a new quality in the subordinated territorial subsystems. Development poles are grouped in polycentric centers classified according to their capacity to specialize the subordinate space. Polycentric settlement is a development strategy of space based on promoting and implementing some policies of consolidating the development poles and growth poles network. By decisional impulses, the relationships between the polycentric network components are need to be redefined, the strong points are to be improved in a superior manner, and a part of the envisaged territory's problems could be solved. The analysis of the polarization capacity and field researches identified the main specialization directions represented on the graphic models by means of development vectors which represent as well the directions and a certain type of qualitative load of development, from the development centers of superior rank towards the subordinate ones. In identifying the role of each development aspects of the polycentric centers, an important role can be played by the concepts of territorial competence and territorial cohesion. Territorial competence is represented by those functionalities which give particularity to the territorial system, and which impose it in the competition with the others. Functional specialization is a determinant factor of territorial competence.

The analysis of territorial competence envisaged the projections of those competences, which would allow the rural settlement to be remarked in the local settlements' network. The territorial cohesion represents the capacity of a polycentric network's components to stay together by means of developing and multiplying the relationships between them. The polycentric development approach is based on several decision levels: the national resource capacity, regional development strategy, intraregional development poles, and local development and growth centers. Urban settlements development policy accomplishes the functional connection with the capital, having the role of coordinating the distribution of information from the capital to the level of the entire region. Whereas regional development policies are urban settlements with an inferior polarization capacity compared to national development, consolidated by the administrative functions held in time. This category is represented by the present county seats which, due to their administrative function, are categorically imposed in the county urban systems. Intraregional development poles are represented by urban settlements which benefited from the regional context of advantages, which contributed to the increase of their polarization capacity compared to countryside. Local development frame has an important role in the functioning of country networks, which contribute to the spread of development from the level of intraregional and regional poles to the local level. The importance of these poles comes from their function of redistributing information in the subordinated rural space. Growth centers are represented by rural settlements, which by the economic activities they hold, may transform into development engines for the highly disadvantaged rural spaces. These are indispensable in elaborating the strategies of polycentric development, specific for the highly disadvantaged

areas. In this category there are enclosed the settlements which play a central role in the highly rural areas, which by specific strategies may contribute to the information transfer towards the periphery of the polycentric settlement centers.

Poly centricity as a social innovation and territorial (regional) development strategy

The concept of polycentric settlement development has been around for a long time both as a normative objective and as the subject of empirical research. Polycentric urban regions have not only been identified as the emergent spatial form of global cities but also have been proposed as a planning solution for achieving efficiency and sustainability goals. According to Talen (2008) the notion of a planned polycentric settlement has experienced a number of iterations, starting with Ebenezer Howard's social city, through notion of regional settlement with emphasized the role of communities as the building blocks of a region. Thus, Polycentricity is implicitly prescribed in the charter for new urbanism, under the heading the region: metropolis, city, and town as economic units as well as environmentally determined finite places that can contain multiple centers within a metropolis. Edges should be clear and development patterns should be contiguous or else organized into towns, villages, and neighborhoods. In a more abstract treatment, polycentric region as a multiply-centered-hierarchy (sic) as a remedy for suburban sprawl.

From a normative perspective, economists, geographers and planners have documented the emergence of polycentric centers in post-industrial societies in the east and west developed countries (Nishimura, 2011), as well as in developing economies like China (Chou, 2011). From a positive perspective, demographic shifts, economic growth, and technological advances have all contributed to the evolution of a new spatial order that is clearly distinct from classic mono-centric models of urban structure and function. In response to these fundamental changes, they tend to co-locate in well defined geographic areas forming new centers of dense employment that are distinct and isolated from the traditional urban core. These centers tend to be characterized by some degree of economic specialization, and are, therefore, sometimes referred to as industry clusters (Anderson, 2001). When these centers reach sufficient size, they are often recognized as regional employment clusters. Thus, a major focus in this field of research has concerned the formation and explanation of settlement clusters on the identification of social innovation, cultural and territorial development in a broader context. Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field that compete but also cooperate. Thus polycentric clusters can be conceived as collections of firms, having a proximate relationship, whose common spatial location provides the basis for at least one shared interest. Long standing economic theory suggests that firms have a natural incentive to form these spatial relationships, because they benefit from positive externalities and economies of scale, commonly known as agglomeration effects. Sources of agglomeration effects include labor pooling, input sharing, human capital spillovers, shared infrastructure, and consumption effects, among others.

The polycentric settlement development has been a persistently recurring idea already over some decades in the Western regions. Spatial development policy requires polycentric settlement development by explicitly naming it among the three objectives of the spatial development perspective adopted in sustainable development era (Brandi, 2015). Polycentricity could be one of the most important spatial objectives in Nepalese context. In line with this, the territorial development also needs much emphasis on polycentric

settlement network development. A main element of the polycentric approach is that development should not exclusively concentrate on the territory of the so called metropolitan cities, the area delimited by the government but there is a definite need for strong urban regions outside the core area which can support a territorially more balanced development of the country.

Region and cities could get stronger and cooperate with each other; they have significant potentials to counterweight the increasing domination of the cores to give dynamism to their own wider hinterlands.

In Nepal, the objective of polycentric settlement network means a double task for development activities. On the one hand, the improvement of the external role of cities can support the polycentric structure of Nepal to a great extent. On the other hand, the monocentric structure of the settlement network of Nepal is a result of the dominance of the capital cities. Beyond capital or Head Quarters, the network of small and medium-sized cities could serve as a skeleton of development; however in Nepal these smaller towns are not yet able to counterweight the dominance of the capital cities and Head Quarters.

The development opportunities of the urban system of Nepal were substantially influenced by significant changes in the 20th century. The urban network of the country had developed in an organic way over centuries. The capital city Kathmandu thus became overweighed in the shrunken urban system. Similarly, the city hierarchies do not have appropriate city functions, which would be, however, necessary for them to serve as real regional centers and to mobilize their surroundings. Nonetheless, it is important to keep in mind how the integration processes can transform and develop the role of cities. The national spatial development strategy aiming to promote territorially more balanced, polycentric development assigned different development poles, and the strengthening of their roles as regional centers which can be classified as a development priority of outstanding importance. The reinforcement of development poles is a double objective. On the one hand, this means the strengthening of the regional (innovation, economic, cultural, governing and commercial) functions of the poles, while on the other hand, the aims is also to create the necessary preconditions for spill-over effects: good accessibility, cooperation links, and the existence sub-centers. It is important to mention that the strategic policy for the development of the Nepalese settlement network, which aims to promote a more balanced, polycentric territorial structure in Nepal. The specific role and importance of polycentric settlement are helping backward areas catch up, harmonious and sustainable regions and areas, sustainable land use, regional public utility systems, eco-technology, renewable energies, local, regional identity, territorial solidarity and equal opportunity, dialogue for partnership, and development of the local economy and local markets.

Policy framework for strengthening territorial cohesion, social innovation and cultural development

The most significant communication of the territorial and cultural development is the need to strengthen territorial cohesion across the country. To achieve this aim, territorial aspects need to be considered in development policy to a greater extent. Due to the currently ongoing reform process of the local development, it will play an even more significant role in strengthening territorial cohesion; however, to make it effective, the distinctive territorial characteristics and unique cultural challenges of each region and locality require more attention than before. In order to attain territorial cohesion, it is necessary to integrate the sub-systems of development policy (besides cohesion policy, agricultural and rural policies,

and competition policy), and meanwhile, to take global processes and challenges into continuous consideration (Moularet & Nussbaumer, 2005). The role of territorial cohesion is grouped into following points.

- Contribution to a culturally, socially, environmentally and economically sustainable through the implementation of territorial cohesion.
- Better integration of the regional development into polycentric settlement development.
- In promoting territorial solidarity, securing better living conditions and quality of life with equal opportunities for all.
- Implementing territorial cohesion is a permanent cooperative process involving the various actors and stakeholders of territorial development. Territorial dimension has to play a stronger role in the future integrated development policy.
- Territorial cohesion can only be achieved through an intensive and continuous dialogue between all stakeholders. This is called territorial governance, where the private sector (especially the locally and regionally based entrepreneurship), the scientific community, the public sector (especially local and regional authorities), non-governmental organizations and different sectors need to cooperate with each other. Integrated urban development and territorial cohesion further contribute jointly to the achievement of the objective of sustainable development.

Polycentric and territorial priorities

The territorial and cultural promote to develop a balanced and polycentric urban system, new urban-rural relationship. It also secures parity of access to infrastructure and knowledge and sustainable development, prudent management and protection of natural and cultural heritage. The main polycentric centers as well as territorial priorities, which contribute to a shift towards a more competitive and sustainable Nepal of diverse regions, hence, to the realization of territorial cohesion by adopting following six priorities.

- Strengthening polycentric development and social innovation through networking of municipals and cities through international networking cooperation of cities and city regions and connecting regional centers with infrastructure networks and extending trans-border networks.
- New forms of partnership and territorial governance between rural and urban areas by enhancing urban-rural partnerships and joint strategies; and new forms of territorial governance arrangements.
- Promotion of regional clusters of competition and innovation across the country by the creation of suitable and innovative clusters where the business community, the scientific community and administrations work together and international cooperation of settlements.
- Supporting the strengthening and extension of trans-border networks using sustainable development of multi-modal transport systems; unhampered access to information and communication technologies; and opportunities for decentralized, efficient, safe and environmentally friendly production of renewable energy.

- Promote trans-border risk management including the impacts of climate change through territorially differentiated adaptation strategies and integrated trans-European and cross-border risk management.

Strengthening ecological structures and cultural resources as the added value for development of coordinated transnational interventions are essential which associated management promoting Nepalese natural and cultural heritage; developing networks of valuable nature areas and cultural landscapes; and strengthening integrated territorial development policies in ecologically or culturally fragile areas in order to harmonize economic development and environmental, social and cultural sustainability.

Conclusion

The polycentric settlement development strategies, policies and plans are prerequisites for achieving the goal of sustainable development and national prosperity as expected in the constitution of Nepal. Polycentric centers not only promote agglomerative economies and facilitate economic growth; they also generate a disproportionate number of trips and promote accessibility network. It can be stated that policy supports that need to promote such polycentric settlement (urban system) development in order to improve the livelihood of the rural population and also meet the national goal of peace, prosperity, and sustainable progress. The polycentric settlement model as a sustainable development encourage housing development within the transit commute shed of these centers. Such policies, combined with simultaneous expansion and coordination of transit service to existing employment centers, would serve to balance jobs and housing within the transit commute sheds and similarly serve the goals. This development strategy also promotes the careful coordination of regional and national level budgetary systems to balance development within a center's periphery. It is therefore, the development plan of the country has to encourage the concentration of economic and livelihood opportunities within superior settlement centers and encourage territorial development by promoting social innovation and cultural development of the centers as well as neighbors of the centers.

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