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Imminent Prosperity at the Doorsteps of Households: Evidence from Socio-kinetics of Rashakai Economic Zone Using Dynamic Two Point Model

EJAZ GUL and IMRAN SHARIF CHAUDHRY

There is a surge in the establishment of special economic zones (SEZs) in developed and developing regions of the world. Many countries are reaping socioeconomic benefits from SEZs. To boost trade, attract FDI and increase productivity, numbers of SEZs have been planned as part of China Pakistan Economic Corridor (CPEC) at different locations along the routes of CPEC. As a case study, this paper explicates socioeconomic impacts of Rashakai SEZ envisioned under the auspices of CPEC. It investigates change in socioeconomic condition of households after establishment of SEZ at Rashakai. For this purpose, primary data on selected socioeconomic variables was collected from respondents at Rashakai and surrounding to ascertain the existing trends in 2016 before establishment of SEZ. Then changes in the values of socioeconomic variables after establishment of SEZ were calculated using Catalyst Action Model (CAM) assuming that SEZ at Rashakai will be completed and fully functional by 2030. Digital analysis of data was carried out with the help of Computer Assisted Qualitative Data Analysis Software (CAQDAS) for the data set before and after the construction of SEZ. At the end, change in socioeconomic condition (ΔS) of households was calculated using dynamic Two Point Model (TPM). Results indicated that SEZ at Rashakai will bring blessings and prosperity for the households of Rashakai and surrounding villages.

JEL Classification: D31, D63, I14, I24, I32, O18
Keywords: Special, Economic, Zone, Socioeconomic, Prosperity, Households

1. INTRODUCTION

World over, SEZs have been taken as magnets for boosting technological and industrial development. Recent research has indicated that in addition to pure economic benefits in terms of FDI, trade and exports, SEZs also improve the socioeconomic life of households owing to enhanced employment, improved education and health facilities and increased energy availability and consumption. SEZs are now taken as catalyst for increasing the socioeconomic prosperity of households in surroundings. As per official document of CPEC, there are nine special economic and industrial zones planned to be developed along the routes of CPEC. Understandably, quantum economic gains are expected to be achieved by development of these nine special zones. These zones will also impact the socioeconomic status of surrounding households as they will be benefitted from the development and modern facilities close to them. Thus, SEZ bring

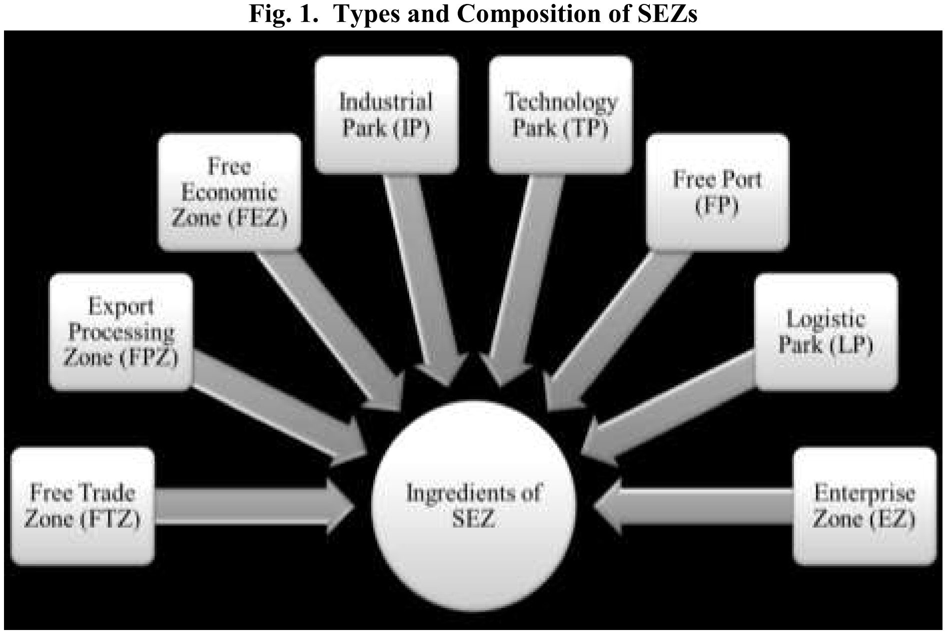
Ejaz Gul <ejazgul@bzu.edu.pk> is Research Associate, School of Economics, Bahauddin Zakariya University, Multan. Imran Sharif Chaudhry <imran@bzu.edu.pk> is Director, School of Economics, Bahauddin Zakariya University, Multan.

much with it for the surrounding households. For example the energy availability increases many fold and consequently socioeconomic life of households improves. In the same context, the objective of this paper is to assess change in socioeconomic status of households in surrounding areas of SEZ at Rashakai using data on selected socioeconomic variables for 2016 (existing) and 2030 (future); with a gap of 15 years. For this purpose an innovative framework of two point model (TPM) was used. Moreover, the Catalyst Action Model (CAM) was used to estimate increase in the values of socioeconomic factors after construction of SEZ Rashakai assuming that it will act as catalyst for the socioeconomic development of the area. Paper validates change in the socioeconomic status of households of Rashakai and surroundings villages after construction of SEZ Rashakai.

2. CONTEXTUAL APPRAISAL ON CONTRIBUTION OF SEZS IN SOCIOECONOMIC DEVELOPMENT

The idea of SEZ has historical context, as the first such experiment was implemented in New York in 1937 after approval of Free Trade Zone Act by the United States Congress in 1934. The concept was striking for other countries as well, as it promised them greater economic development owing to enhanced competitiveness, diversification in exports and increased foreign investment. Using SEZ as policy tool, many developing countries have promoted industrialisation and economic growth at fast pace. Today, most successful zones are found in East Asia and Latin America, while majority of African zones could not achieve the dividends. In essence, Special Economic Zone (SEZ) is a well-defined geographical space where economic activities are undertaken by firms under special policy strands and administrative facilities. SEZ can be single or composite and it can house one or many of the facilities indicated in Figure 1.

Fig. 1. Types and Composition of SEZs



In essence SEZ is developed to attract foreign investment, develop domestic industries with modern technology, increase exports and encourage policy reforms. Globally SEZs have been mostly taken as FDI magnets and its impact on the households is not deeply investigated. SEZs provide access to highly developed infrastructure, improved and uninterrupted energy, public facilities such as education and health, and advance support services which can benefit households in surroundings of SEZs. Countries like Indonesia, Malaysia, Japan, South Korea, Hong Kong, Taiwan, China and now even Vietnam have benefitted from SEZs. Modern social scientists have investigated socioeconomic impacts of SEZs and have concluded that SEZs can serve as engines of growth for developing countries. For example Aggarwal carried out an incisive study to elucidated social and economic impacts of SEZs. It was concluded that these zones improve overall economic growth and social development of community [Aggarwal (2012)]. Similarly, he highlighted that SEZs are no more associated with economic benefits only; rather SEZs have huge social impacts on communities surrounding SEZs [Aggarwal (2012)]. In an extensive research work, Amir Ahmadi concluded that export processing zones increased quality and quantity of exports in Asia and contributed to higher economic growth in these countries [Amir Ahmadi (1995)]. Similarly, Caniels has elucidated that industrial and technological clusters in special economic zones increase innovativeness and improve quality of products and thus enhanced competitiveness is generated in firms. It was also highlighted that these clusters have huge social benefits in the form of improved facilities and job creation [Caniels (2005)]. Dong carried out research on SEZs of China. He concluded that these zones have great impact on the economic development of China; rather these zones boosted development process owing to increase in exports and investments [Dong (2000)]. Similarly, Dowla carried out research on export processing zones of Bangladesh and concluded that these zones have huge economic and social impacts. He concluded that due to development of export processing zones, exports of Bangladesh raised by 2-3 percent annually [Dowla (1997)]. A very insightful study has been conducted by Esmaeilpour to study impact SEZ on social development of populace in surrounding of SEZs. It was concluded in the study that development of SEZs improves socioeconomic conditions of populace in the city and surroundings areas owing to use of advanced facilities available in these SEZs. These advanced facilities become available to surrounding households as derivative of the development in the shape of SEZs [Esmaeilpour (2016)]. Similarly, Fujita has elucidated the beneficiaries of geographical clustering of industries and its impacts. It was concluded in study that people are also the beneficiaries of social benefits of such clustering [Fujita and Thisse (2003)]. In a study, Ge highlighted the process of economic transition in China and role of SEZ in that transition. It was concluded in study that SEZ has been an effective tool to accelerate this transition [Ge (1999)].

Helsley worked on economics of agglomeration and indicated how coherent and effective agglomeration of industries can augment the process of economic growth in regional context [Helsley (2004)]. In a scientific study James elucidated the performance of China's SEZs. He concluded that SEZs have intra and inter country significance. Besides pure economic pluses, SEZs have socioeconomic ambience for areas surrounding SEZs [James (1985)]. Similarly, Jauch has investigated the link between export processing zones and sustainable development. He elucidated that export processing zones can be used as policy tools to achieve goals of sustainable development [Jauch (2002)]. In a thoughtful investigation, Johansson explained that export processing zones can act as catalyst of socioeconomic development. He concluded that by developing export processing zones, investment increases, quality and quantity of exports increases and overall socioeconomic development accelerates [Johansson and Nilsson (1997)]. In a study on export processing zones in Dominican Republic Kaplinsky explained contributions of these in economic growth of Dominican Republic. It was concluded in study that these zones transformed manufacturers into coherent commodities who participated in growth process [Kaplinsky (1993)]. In a quantitative study, Karunaratne explained link between export processing zones in Sri Lanka and poverty reduction. It was explained empirically in study that export processing zones have facilitated and accelerated trade activities and thus paved ways for inclusive growth and poverty reduction [Karunaratne and Abayasekara (2013)].

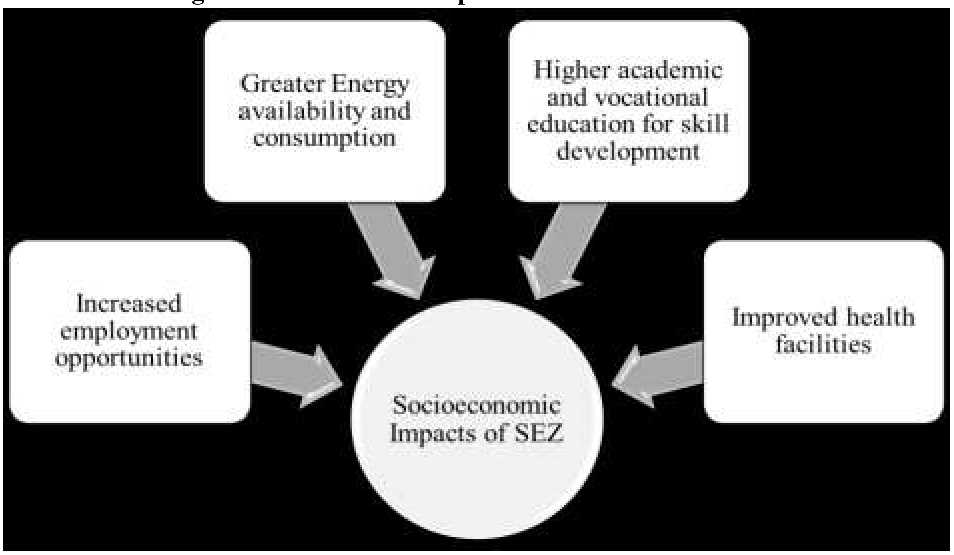
In an incisive study, Litwack elucidated that SEZs are catalysts for economic transition in different countries owing to socioeconomic impacts of these zones [Litwack and Qian (1998)]. Similarly, Paul has investigated the effects of SEZ on living standards of displaced households. It has been concluded in study that SEZs contribute to improve socioeconomic standards of households in surrounding as they take advantage of advanced facilities available in SEZ and surroundings [Paul and Sarma (2003)]. In a study on China's SEZs, Peebles concluded that SEZs increases prospects of greater socioeconomic development, however, policies are required to be configured, orientated and implemented accordingly. In absence of sound regulatory policies, SEZs may not give desired results [Peebles (1988)].

Plummer asserted the significance of structure and dynamics of industrialisation based on geographical agglomeration. It was concluded in study that geographical grouping of industries accrued socioeconomic dividends in case of many developing countries [Plummer (2006)]. Rosa has indicated that free trade zones in Sri Lanka have increased welfare of women workers, ensured gender balance and reduced gender discrimination [Rosa (1991)]. In an empirical study, Sampat investigated impacts of SEZs on society. It was concluded in the study that SEZs have positive contribution to societal development besides economic benefits [Sampat (2010)]. Likewise, Walsh has indicated that by aligning social policy with development policy of SEZs, socioeconomic blessings of SEZs can be amplified manifold. Optimal social benefits of SEZs can be achieved with effective orientation of social policy [Walsh (2013)]. Walz has elucidated in research on urban economics that localised growth effects of SEZs make them hubs of socioeconomic development for communities [Walz (1996)]. In has been highlighted by Wu in international encyclopaedia of human geography that export processing zones and SEZs have many sociocultural benefits in addition to pure economic ones [Wu (2009)]. Thus from the contemporary research it can be safely concluded that development of SEZs bring prosperity to the areas where these zones are located.

3. CONJECTURAL STRUCTURE

As explained earlier, numerous socioeconomic benefits can be accrued by creation of SEZ. Pure economic benefits include increase in productivity, attract FDI, advancement in technology and increase in trade. As a byproduct, SEZ also contributes to prosperity of households of areas where these zones are located by rendering benefits like changes in per capita income, increase in male and female employment opportunities, increase in male and female education enrolments, better health facilities, and enhanced availability of energy as shown in Figure 2.

Fig. 2. Socioeconomic Impacts of SEZs on Households



Although many explicit and implicit variables contribute to increase or decrease of socioeconomic condition of households, we considered only prominent ones for ease of calculations. Thus, change in socioeconomic condition of households 'ΔS' was taken as dependent variable whereas seven relevant explanatory variables (regressors or independent variables) were taken to assess change in socioeconomic condition of households. Description of dependent and independent variables is given in Table 1.

Although some of the variables may seems missing but the point here is that if there is positive change in socioeconomic condition of household with these seven variables, inclusion of more variables will only substantiate the overall result, thus we can safely assume that our model based on these variable is good enough to assess the change in socioeconomic conditions of households due to construction of SEZ. Some environmental degradation due to industrial activities is inescapable, but that was not the focus of this study. Therefore, using Leonhard Euler functional notation, index of socioeconomic condition of households was shown as function of seven independent variables as given in Equation (1).

$$\text{Index of socioeconomic condition } (S) = f\left(I, M_e, F_e, E_m, E_f, H, E\right)\ldots \quad \ldots \quad (1)$$

To estimate the change in index of socioeconomic condition (ΔS) of households in Rashakai and surroundings, two temporal points were selected, 't_1' and 't_2', where 't_1' was taken as 2016 (existing) and 't_2' was taken as 2030 (future). The existing index of socioeconomic condition of households at Rashakai and surroundings at time 't_1' was reflected by 'S_1' and that of future at time 't_2' was shown by 'S_2'. Since, the model used in this paper estimated socioeconomic condition of households at two temporal points

Table1

Description of Dependent and Independent Variables

Variables		Symbols	Discerption
Dependent	Index of socioeconomic condition of households	S	Dependent variable reflecting index of socioeconomic condition of households at Rashakai and surroundings
-	Change in socioeconomic condition of households	ΔS	Variable showing change in index of socioeconomic condition of households at Rashakai and surroundings
Independent	Per capita income	I	Average per capita income of households in Rashakai and surroundings in 2016
	Male employment	M_e	Average number of male employees in private and public sector formal jobs in 2016
	Female employment	F_e	Average number of female employees in private and public sector formal jobs in 2016
	Male education	E_m	Enrolments of male students minimum intermediate and above in educational institutes (public and private schools, colleges and above) in 2016
	Female education	E_f	Enrolments of female students minimum intermediate and above in educational institutes (public and private schools, colleges) in 2016
	Health	H	Number of patients in the public and private hospitals, basic health units, treatment centres in 2016
	Energy	E	Per capita electricity consumption (kilowatt hours) of households in Rashakai and surrounding in 2016

that is why it is called as two point model (TPM). Instead of using traditional time series forecasting, it uses innovative approach of Newton-Leibniz Integration Process (NLIP) duly catering for the missing variables and other errors in data. It is dynamic in nature and caters for period between the two temporal extremities. Based on values of explanatory variables, 'S_1' and 'S_2' can be calculated by Equations (2) and (3).

$$S_1 = \frac{\Omega \times \mathrm{T}\left[\int_1^n e_{t_1}\right]}{\sum_1^n [\mathrm{v}_{t_2} - \mathrm{v}_{t_1}]} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots. \quad (2)$$

$$S_2 = \frac{\Omega \times \mathrm{T}\left[\int_1^n e_{t_2}\right]}{\sum_1^n [\mathrm{v}_{t_2} - \mathrm{v}_{t_1}]} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

Here, 'Ω' was a socioeconomic constant dependent on the prevailing socioeconomic condition in the area. It can take values from 0 to 0.99. For our study this was taken as 0.25, a value barely acceptable from socioeconomic point of view. 'T' was the time period which was 15 years in our case. 'e' was the Newton Leibniz equation for particular year, limit 'n' in the Newton Leibniz equations indicated number of variables which were 7 in our case and 'v' was numerical value of each variable in particular year. Change in index of socioeconomic condition of households at Rashakai and surrounding was the difference between 'S_2' and 'S_1' as shown in Equation (4).

$$\text{Change in index of socioeconomic condition } (\Delta \mathrm{S}) = \mathrm{S}_2 - \mathrm{S}_1 \quad \ldots \quad \ldots \quad (4)$$

But the question was how to forecast and extrapolate the values of explanatory variables at time 't_2'. For this purpose, catalyst action model (CAM) was used; assuming that establishment of SEZ will act as catalyst for socioeconomic development of Rashakai and surroundings. Catalyst is a thing that increases the rate of a process [Behr (2010)]. CAM is based on measuring the kinetics and dynamics of the catalysis process [Pagni (2002)]. Using CAM for kinetics of catalyst action, we calculated catalystic effect on value of explanatory variables as shown in Equation (5).

$$\text{Catalystic Effect, CE} = \pm \left[\Psi \mathrm{v}_{t_1} + \frac{\sum_1^n [\mathrm{v}_{t_1}]}{\mathrm{T}} + \Psi \frac{\mathrm{T}}{e_{t_1}}\right] \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

Here 'Ψ' was socio-kinetic constant which can take value from 0 to 0.99. Again for this case study its value was taken as 0.25. 'T' was the time period and 'v' was numerical value of explanatory variable in a particular year. Value of 'Ψ' as 0.25 was justified as we took the value of 'Ω' as 0.25, therefore, if there was any bias that was automatically obviated. As explained earlier, limit 'n' indicated number of variables which were 7 in our case. The '±' for Equation (5) is for additive and subtractive effect of catalyst. For example, all variables had additive effect of catalyst except health which had subtractive effect as the number of patients in public and private hospitals would understandably reduce after development of SEZ. Taking account of this catalystic effect, future values of explanatory variables at time 't_2' were calculated as shown in Equation (6)

$$\mathrm{v}_{t_2} = \mathrm{v}_{t_1} + \mathrm{CE} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

Equations (2) to (6) have been developed after an extensive social research. These equations can be generalised to any number of variables and these are applicable to rural communities across the globe.

Based on above mentioned framework, various propositions were worked out. These propositions are indicated in Table 2.

Table 2

Various Propositions for Change in Socioeconomic Conditions of Households

Propositions	Connotations
$\Delta S > 0$	Development of Rashakai SEZ will improve socioeconomic conditions of households of Rashakai and surroundings
$\Delta S \leq 0$	Development of Rashakai SEZ will not improve socioeconomic conditions of households of Rashakai and surroundings. Socioeconomic condition will either remain the same or will get degraded

After this innovative modelling, the techno-economic description of Rashakai SEZ and demography of research area is explained in the next section.

4. DEVELOPMENT OF SEZS UNDER CPEC AND SILHOUETTE OF RASHAKAI SEZ

To boost up trade, productivity, exports and attract FDI, nine SEZs of different types have been planned at different locations of Pakistan under CPEC (http://cpec.gov.pk/special-economic-zones-projects). Feasibility studies of most of the SEZs have been completed and development works are being initiated for timely completion of these SEZs. Locations of these zones are indicated on map in figure 3. These nine SEZs are of different types encompassing mixed industries, marble city and technology parks. These SEZs have been carefully located considering their, road, rail, sea and air connectivity. Moreover, land acquisition for these SEZs is in progress. Detailed description of these SEZs is given in Table 3.

Rashakai SEZ is located on M1 Motorway at distance of 140 kilometres from Islamabad and 50 kilometres from Peshawar. Rashakai is a medium size town of Khyber Pakhtunkhwa Province with a population of approximately 118,000 individuals. This economic zone is at a distance of 115 kilometres from Afghan border. It has well established road, rail and air connectivity as indicated in Table 3. Its central location is expected to make it as industrial, trade and economic hub for the country. Location of Rashakai SEZ is indicated in Figure 4.

Fig. 3. Locations of Planned SEZs under CPEC

Table 3

Description of Nine SEZs Planned under CPEC

Projects	Provinces/ Areas	Area (Acres)	Type of Industries	Connectivity (Kilometres) Motorway/ Highway	Airport	Railway Station	Dry Port	Sea Port	City Centre
Moqpondass SEZ	Gilgit-Baltistan	250	Marble / Granite, Iron Ore Processing, Fruit Processing, Steel Industry, Mineral Processing Unit, Leather Industry	15	55	-	65	-	65
Mohmand Marble City	Federally Administered Tribal Area	500	Marble industry	20	215	205	205	-	215
Rashakai SEZ	Khyber Pakhtunkhwa	1000	Fruit, Food, Packaging, Textile, Stitching, Knitting, Technology	5	50	25	65	-	15
ICT Model Industrial Zone	Islamabad	2000	ICT Industry	10	10	25	25	-	5
Bhimber Industrial Zone	Azad Kashmir	1000	Mixed industries	20	100	100	45	-	45
Punjab - China Economic Zone Sheikhupura	Punjab	5000	Mixed industries	5	55	6	45	-	10
Bostan Industrial Zone	Balochistan	1000	Fruit Processing, Agriculture machinery, Pharmaceutical, Motor Bikes Assembly, Chromite, Cooking Oil, Ceramic industries, Ice and Cold storage, Electric Appliance, Halal Food Industry	2	23	32	32	713	32
SEZ Dhabeji	Sindh	1000	Mixed industries	4.5	80	5	-	85	85
Industrial Park Port Qasim Karachi	Sindh	1500	Mixed industries	2	25	15	15	1	15

Source: <http://cpec.gov.pk/special-economic-zones-projects>

Rashakai SEZ will have improved infrastructure and modern facilities. As a byproduct, these improved facilities will also be available to local of the areas surrounding this SEZ. Due to linkage of SEZ with local area development, the socioeconomic indicators of surrounding areas are likely to improve. How much? This question is the focus of this paper. Presently the per capita income of households of the area is approximately 110000 Pakistani Rupees (PKR) per year. Presently most significant economic activity at Rashakai is cloth trading. Households are also engaged in domestic agriculture activities. There are five major villages around Rashakai SEZ. These include Rashakai itself, Sowkai, Bara Banda, Risalpur and Raj Muhammad Kalli. Besides these five villages, there are small pockets of population scattered around Rashakai SEZ. Total population of households in these villages is approximately 523300 individuals out of which 272116 (52 percent) are females and 251184 (48 percent) are males. According to demographic estimate 52 percent of the male and female population is of school and college going age. A glimpse of villages and population hubs is shown in figure 5. The household size in villages is 9 to 10 individuals per house. Houses are mostly made of bricks with 3 to 5 rooms per house. Existing literacy rate in village is 35 percent. There are primary and high schools for males and females separately. There is a rural health centre at Rashakai; however, critical patients are taken to Hospitals at nearby urban centres, Mardan and Nowshera. People have fields on fringes of villages where they do their subsistence agriculture. Electricity availability to households is very less due to frequent power breakdowns. Households are using different sources of energy including generators and solar panels. Clean drinking water is collected from underground aquifer through tube wells in the houses and fields. Households have no elaborate arrangements of sanitation except for 2 to 3 lavatories per house and unlined muddy drains. Similarly, sewerage and waste disposal is being done by the households on self-help basis and there is no organised system of disposal.

Rashakai SEZ will be developed in three phases. In phase 1, 100 small factories of different types will be developed and made functional. In phase 2, another 100 factories of manufacturing sector of steel, medicine, food, textiles, and light and heavy machinery parts will be developed and operationalised. In phase 3, information technology city will come up on 150 acres land to produce products in hardware, software and other items of information technology. This state of the art information technology city will be comprised of modern expo centre, hard and software development clusters, innovation cluster and a well-equipped academic cluster. Components of information technology city at Rashakai SEZ are indicated in Figure 6.

Fig. 4. Location of Rashakai SEZ

Fig. 5. Villages and Population Hubs around Rashakai SEZ

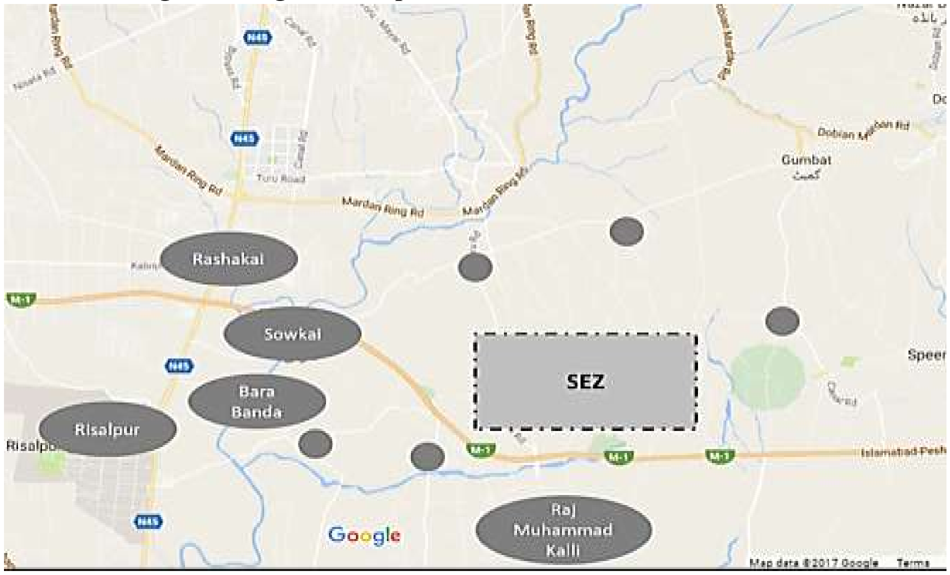
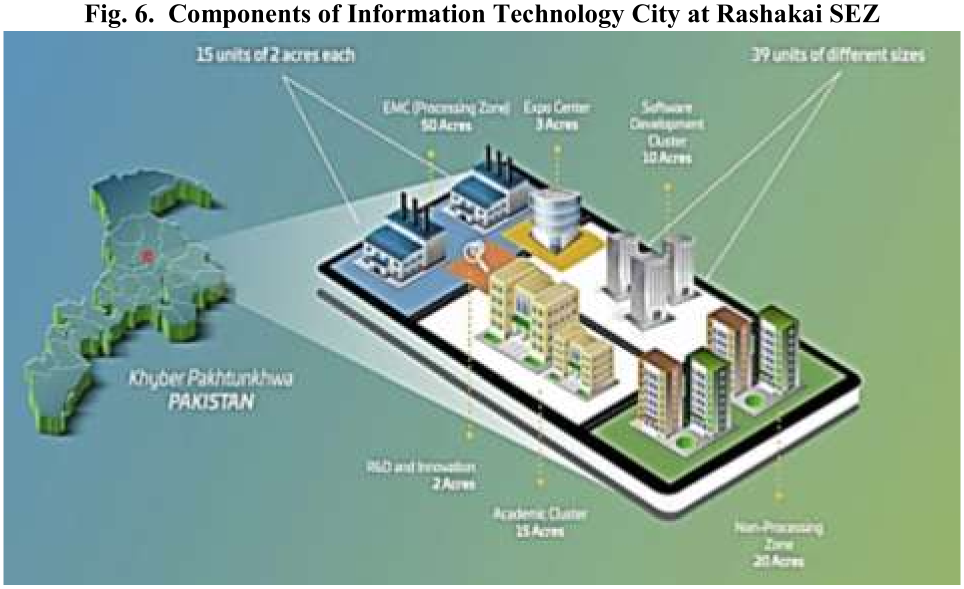


Fig. 6. Components of Information Technology City at Rashakai SEZ



Source: <http://www.kpezdmc.org.pk/>

One glaring feature of the zone is that it will have its own 225 megawatts gas thermal power house to ensure cheap and uninterrupted power supply to the factories established. In addition this will also benefit the households of surrounding areas. It is expected that 30 to 40 thousands jobs will be available for employing youth of Rashakai and other surrounding areas. It is also expected that besides giving boost to the industrial and productive sectors, the zone will create huge direct and indirect benefits for the households of surrounding areas including education, health and energy.

5. RESEARCH METHODS AND DATA COLLECTION

To explore socioeconomic condition of households of Rashakai and surrounding, simple research techniques were used. Data was collected through questionnaire from respondents of five villages including Rashakai itself, Sowkai, Bara Banda, Risalpur and Raj Muhammad Kalli. Questionnaire contained seven simple easy to answer questions about seven explanatory variables of study. Except Rashakai which had population of approximately 80000 people, population of remaining four villages was almost same, 25 to 30 thousand people. Data was collected from random sample of 400 respondents of each village making a total sample size of 2000 respondents. Composition of the sample included commoners, local community leaders, elders, academia, teachers and investors. Efforts were made to collect the data from educated respondents especially teachers. Sample characteristics are indicated in Table 4.

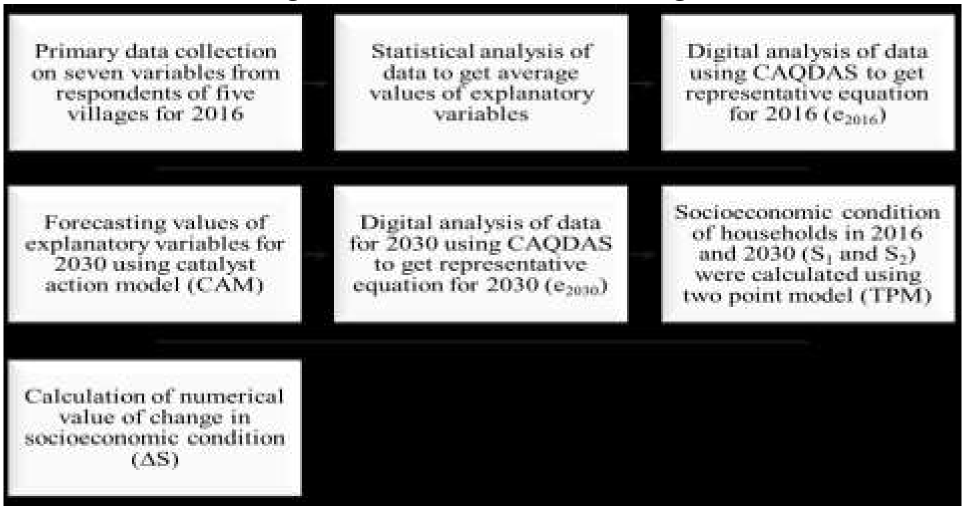
Table 4

Sample Characteristics of Respondents from Study Areas

<table>
<tr><th>Composition</th><th>Education</th><th>Age</th><th>Gender</th><th>Size</th><th>Features</th></tr>
<tr><td>Community leaders and elders</td><td>Minimum Graduate</td><td rowspan="4">25 - 50 years</td><td rowspan="4">No gender bias. However, at least 10 % of respondents from each category were females</td><td>100</td><td>Community leaders having representation in masses</td></tr>
<tr><td>Academia and school teachers</td><td>Minimum Graduate</td><td>100</td><td>Academia and teachers from public and private sector education institutes</td></tr>
<tr><td>Investors and factory owners</td><td>Minimum Higher Secondary School</td><td>100</td><td>Investors and factory owners from public and private sector initiatives</td></tr>
<tr><td>Commoners</td><td>Minimum Secondary School</td><td>100</td><td>-</td></tr>
</table>

After collection of data, statistical analysis was carried out to calculate average value of explanatory variables for Rashakai and surrounding. Digital analysis of this data was carried out with help of Computer Assisted Qualitative Data Analysis Software (CAQDAS) to get representative equation for 2016 (e_{2016}). This was followed by forecasted value of the same variables in 2030 using Hinshelwood catalyst action model (CAM) as shown in Equation (5). Again, these values were fed into Computer Assisted Qualitative Data Analysis Software (CAQDAS) to get representative equation for 2030 (e_{2030}). Then, the numerical values of dependent variables, socioeconomic condition of households in 2016 and 2030 (S_1 and S_2) were calculated using two point model (TPM) as shown in Equations (2) and (3). In the end, numerical value of change in socioeconomic condition (ΔS) was calculated with help of Equation (4). Flow chart of research design is indicated in Figure 7.

Fig. 7. Flow Chart of Research Design



6. STATISTICAL AND DIGITAL ANALYSIS OF EXISTING SOCIOECONOMIC CONDITIONS

Data collected from respondents of five villages was tabulated and statistical analysis was carried out. Results of statistical analysis are shown in Table 5. Analysis indicated that average per capita income of households of Rashakai and surroundings was 110829 Pakistani Rupees (PKR) per year with moderate positive skewness and negative kurtosis; positive skewness indicated that households with low income were more than high income and negative kurtosis (platykurtic) indicated that distribution is flatter than Gaussian distribution with light tails. All variables had positive skewness and negative kurtosis indicating that in 2016 proportion of deprived households was more than the blessed. In all the cases mean was greater than the median.

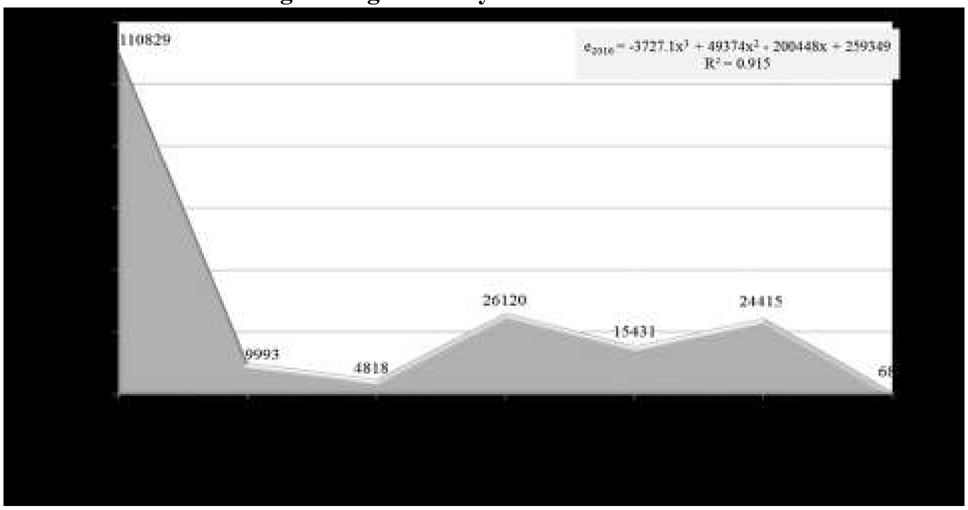
Table 5

Statistical Analysis of Data Collected from Respondents of Rashakai and Surroundings

Variables	Symbol	Rashakai	Sowkai	Bara Banda	Risal-pur	Raj M. Kalli	Aver-age	Standard Deviation	Median	Skew-ness	Kurto-sis
Per capita income (PKR per year)	I	136200	96389	90619	141612	89326	110829	25839.01	96389	0.5867	-3.13
Male employment (numbers)	M_e	13690	9036	8290	12816	6135	9993	3175.58	9036	0.1267	-2.09
Female employment (numbers)	F_e	7650	1616	4390	8406	2030	4818	3126.62	4390	0.1946	-2.83
Male education (enrolments in numbers)	E_m	36289	18919	20199	37366	17826	26120	9818.15	20199	0.5823	-3.25
Female education (enrolments in numbers)	E_f	20916	10703	12613	23619	9303	15431	6422.15	12613	0.5598	-2.58
Health (patients in numbers)	H	35339	20690	16503	38612	10933	24415	12032.54	20690	0.2791	-2.51
Energy (kilowatt hours per capita)	E	756	660	596	869	566	689	124.00	660	0.7363	-0.76

After statistical analysis data was fed into Computer Assisted Qualitative Data Analysis Software (CAQDAS) for digital analysis. CAQDAS is multipurpose software for analysis of social data to obtain governing equation. This software works on repeated iteration and attenuation to reach to an accurate representative equation of the average data values with coefficient of determination 'R^2'. Digital graph is indicated in figure 8 while representative equation is shown as Equation (6).

Fig. 8. Digital Analysis of Data for 2016



In Figure 8, explanatory variables are on x-axis while values of these variables are along y-axis. As can be seen, Equation (6) is cubic polynomial function of variables. The 'R^2' value of 0.91 indicates goodness and accuracy of results.

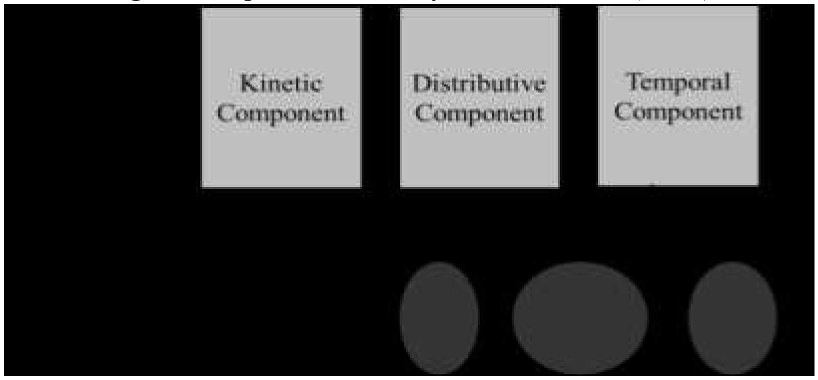
$$e_{2016} = -3727.1x^3 + 49374x^2 - 200448x + 259349 \qquad \ldots \qquad \ldots \qquad \ldots \qquad (6)$$

In Equation (6), term on left hand side 'e_{2016}' gives the combined socioeconomic effect of seven explanatory variables in 2016 while 'x' term on the right hand side indicates variation in the variables. Numerical value of 'e_{2016}' was calculated using Newton-Leibniz Integration Process (NLIP) as indicated in Appendix 1. Numerical value obtained after calculation was 137718 which was unit less being an arbitrary index of combined effect of explanatory variables.

7. ENVISIONING FUTURE BY CATALYST ACTION MODEL (CAM) AND DIGITAL ANALYSIS OF FORECASTED VALUES

After digital analysis of data obtained from respondents, values of variables were calculated for 2030 (15 years gap). For this purpose, catalyst action model (CAM) was used. As shown in Equation (5), CAM has three components; kinetic, distributive and temporal. In essence, this wholesome model caters for kinetics of the phenomenon under study, the distributive effects of variables and temporal effects of the whole activity. Components of this model are indicated in Figure 9. Model has inbuilt mechanism to cater for the errors and missing terms.

Fig. 9. Components of Catalyst Action Model (CAM)



Data values were put into this model and values of variables for 2030 were calculated with the help of Equation (6). Results are indicated in Table 6.

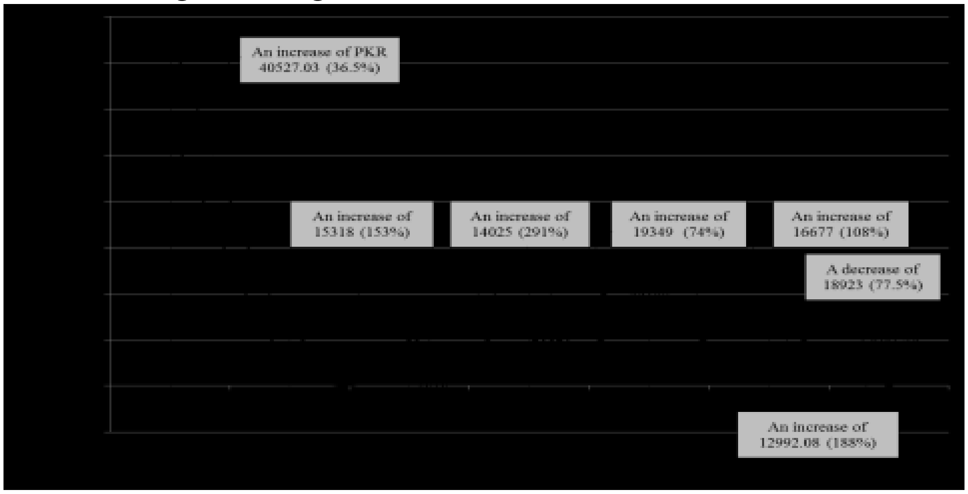
Table 6

Results of Catalystic Effects and Future Values of Variables

Variables	Symbol	Values in 2016 (V_{t1})	Kinetic Constant (Ψ)	Kinetic Compo-nent (ΨxV_{t1})	Sum of Varia-bles in 2016 ∑(V_{t1})	Time Lapse (T)	Distribu-tive Compo-nent [∑(V_{t1})/T]	Combined Effect of Variables in 2016 (e_{t1})	Temporal Compo-nent [ΨxT/e_{t1}]	Catalystic Effect (CE)	Future Values in 2030 (V_{t2})
	a	b	c	d	e	f	g	h	i	j=d+g+i	b+j
Per capita income (PKR per year)	I	110829.2	0.25	27707.3	192296	15	12819.73	137718	2.72296 E-05	40527.03	151356.23
Male employment (numbers)	M_e	9993	0.25	2498.35	192296	15	12819.73	137718	2.72296 E-05	15318.08	25311.48
Female employment (numbers)	F_e	4818	0.25	1204.6	192296	15	12819.73	137718	2.72296 E-05	14024.33	18842.73
Male education (enrolments in numbers)	E_m	26120	0.25	6529.95	192296	15	12819.73	137718	2.72296 E-05	19349.68	45469.48
Female education (enrolments in numbers)	E_f	15431	0.25	3857.7	192296	15	12819.73	137718	2.72296 E-05	16677.43	32108.23
Health (numbers)	H	24415	0.25	6103.85	192296	15	12819.73	137718	2.72296 E-05	-18923.58	5491.82
Energy (kilowatt hours per capita)	E	689.4	0.25	172.35	192296	15	12819.73	137718	2.72296 E-05	12992.08	13681.48

Table 5 indicated very interesting facts. The kinetic component varied for all the explanatory variables. However, the distributive and temporal components were same for all the variables. This was due to the fact that CAM considers kinetics as the prime source of acceleration in the phenomenon while takes the combined distributive and temporal effects on variables as same. When the effect of all three components is combined, the future values of variables change significantly as shown in Figure 10.

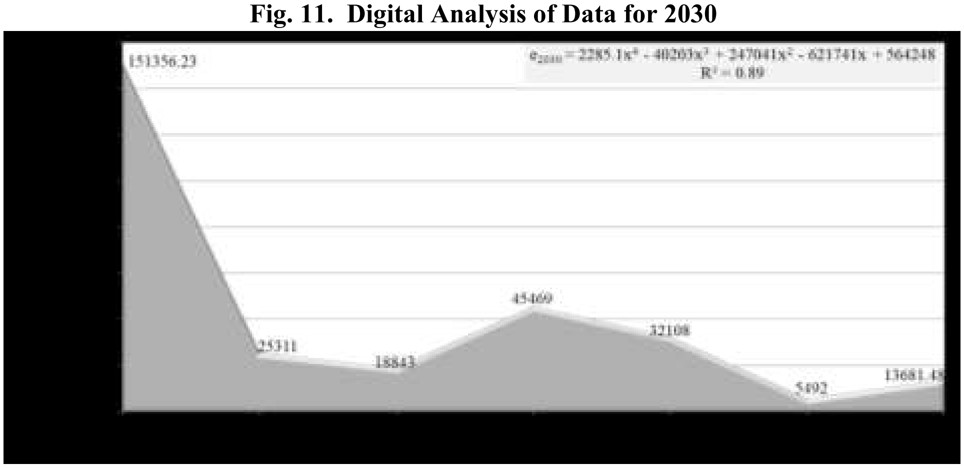
Fig. 10. Changes in Values of Variables for 2016 and 2030



As shown in figure 10, all variables increased in different proportions except number of patients which decreased by 77.5 percent due to improved health facilities after construction of SEZ at Rashakai. Maximum increase was noticed in female education. This was because of the present low enrolment of girls in schools (3.4 percent of present girls' population of Rashakai and surroundings) which would increase to 13.3 percent in 2030 after completion of SEZ at Rashakai. In fact, even with almost triple increase in the school enrolments of girls, the percentage raised to only 13.3 percent of the total girls population in 2030. An interesting fact was increased per capita availability of energy to households of Rashakai and surroundings. Availability of uninterrupted modern energy to surrounding households will definitely have immense socioeconomic impact.

After calculation of future values of variables by CAM, data was again fed into CAQDAS for digital analysis to obtain governing equation 'e_{2030}'. After numerous iterations and attenuations by software, digital graph obtained for data values of 2030 is shown in Figure 11.

Fig. 11. Digital Analysis of Data for 2030



In Figure 11, on x-axis we have explanatory variables while values of these variables are shown on y-axis. Digital analysis of data for 2030 also gave representative equation with 'R^2' value. Representative equation is indicated as Equation (7) which is a quartic polynomial function of variables. The 'R^2' value of 0.89 shows goodness of results.

$$e_{2030} = 2285.1x^4 - 40203x^3 + 247041x^2 - 621741x + 564248 \quad \ldots \quad \ldots \quad (7)$$

Similar to Equation (6), in Equation (7), term on left hand side 'e_{2030}' gives the combined socioeconomic effect of seven explanatory variables in 2030 while 'x' term on the right hand side indicates variation in these variables. Newton-Leibniz Integration Process (NLIP) was used to calculate numerical value of 'e_{2030}' as shown in Appendix 1. After calculation, numerical value obtained for 'e_{2030}' was 185256.12. This value had no unit being an arbitrary index of combined socioeconomic effect of explanatory variables.

8. RESULTS DYNAMIC TWO POINT MODEL (TPM)

As explained earlier, two point model (TPM) considers analysis of data at two temporal points using the known data for one of the temporal point. In this paper we assumed that SEZ at Rashakai would be completed in 2030, therefore with the help of TPM, we used known data of 2016 to calculate socioeconomic impact of SEZ at Rashakai in 2030 after forecasting the values of variables for 2030. For this purpose, relevant data was put into Equations (2), (3) and (4). Results are indicated in Table 7.

Table 7

Results of Dynamic Two Point Model (TPM)

Elements	Value
Socioeconomic constant (Ω)	0.25
Time duration (T)	15 years
Sum of changes in the values of variables [$\sum(v_{t2} - v_{t1})$]	99965.07
Combined socioeconomic effect of variables in 2016 (e_{2016})	137718
Combined socioeconomic effect of variables in 2030 (e_{2030})	185256.12
Index of socioeconomic condition of households in 2016, $S_1 = \frac{\Omega \times T[\int_1^n e_{2016}]}{\sum_1^n [v_{t_2} - v_{t_1}]}$	5.166
Index of socioeconomic condition of households in 2030, $S_2 = \frac{\Omega \times T[\int_1^n e_{2030}]}{\sum_1^n [v_{t_2} - v_{t_1}]}$	6.950
Change in index of socioeconomic condition ($\Delta S = S_2 - S_1$)	1.783
Increase (%)	34.52

Table 7 indicates glaring impact of Rashakai SEZ. Our results show that $\Delta S>0$, therefore, proposition 1 presented in Table 2 holds good and it can be concluded that development of Rashakai SEZ will improve socioeconomic conditions of households of Rashakai and surroundings villages. One of the objectives of this paper was to quantify this improvement in socioeconomic conditions of households. The last row of table 7 indicates that socioeconomic conditions of households will improve by 34.52 percent. After completion and operationalisation of SEZ at Rashakai by 2030; increased employment opportunities, better education and health facilities and enhanced availability of per capita energy will raise the living standards of households of Rashakai and surrounding villages.

9. CONCLUSIONS AND POLICY RECOMMENDATIONS

Analysis and results of study clearly indicates that development of SEZ at Rashakai will have considerable socioeconomic impact on households of Rashakai and surrounding villages. Following conclusions have been drawn from results of study.

(a) Values of explanatory variables related to per capita income, employment, education and per capita energy availability have improved after development of SEZ at Rashakai.
(b) Owing to availability of better health facilities, number of patients reduced considerably after development of SEZ at Rashakai.
(c) Net improvement of 34.5 percent has been achieved in socioeconomic condition of households of Rashakai and surrounding after completion and operationalisation of Rashakai SEZ in 2030.
(d) If so much of improvement in the socioeconomic conditions of households is due to development of one SEZ, we can imagine the magnitude of improvement in socioeconomic conditions when all SEZs planned under CPEC will be completed.

While we have determined that development of SEZ has immense socioeconomic impact on the households, some policy strands need to be kept in focus which are listed below.

(a) During planning and feasibility of SEZ, social dimension of SEZ should be kept in mind alongside the pure economic dimension. Modern health, education and energy facilities planned in SEZs should be extended to surrounding households as well. Households should be considered as the immediate recipients of social facilities planned in SEZs.
(b) Local skilled and unskilled labour should be absorbed optimally in the SEZs so as to improve the socioeconomic conditions of local households. This is being practiced in the SEZs in developed countries. As thumb rule at least 40 percent of the skilled and unskilled labour should be from the local populace.
(c) In order to fulfill the needs of skilled and unskilled labour in SEZs, education of local population should be orientated and configured accordingly. Development of vocational and technical training institutes in surrounding of SEZs should be considered alongside other educational initiatives.
(d) Free on job training (OJT) facilities should be extended to local youth especially females of surrounding households to increase employment opportunities for females. Inside SEZs, special training centres should be created for training of youth inside SEZs.
(e) Similarly, modern health facilities inside SEZs should be extended to local populace. Alongside, capacity of surrounding local health infrastructure should be upgraded to augment health facilities inside SEZs. Establishment of free medical camps in surrounding villages should be supported by SEZ's administration.
(f) As per plan all SEZs will have uninterrupted modern energy availability for efficient industrial production. This facility should be also be extended to local populace surrounding SEZs to boost local trade and business activities.

Development of SEZs under CPEC will not only boost industrial productivity, trade and export, but will also bring prosperity at the door steps of households of surrounding villages. Households will reap the blessings of these SEZs and their living standards will improve manifold.

APPENDIX 1

Combined Socioeconomic Impact of Variables in 2016 (e_{2016})

$$E_{2016} = \int_{n=1}^{n=7}(-3727.1x^3 + 49374x^2 - 200448x + 259349)dx$$

$$e_{2016} = {}_1^7\left[\frac{-3727.1x^4}{4} + \frac{49374x^3}{3} - \frac{200448x^2}{2} + 259349x\right]$$

$$E_{2016} = {}_1^7\left[\frac{-3727.1(7)^4}{4} + \frac{49374(7)^3}{3} - \frac{200448(7)^2}{2} + 259349(7)\right] - {}_1^7\left[\frac{-3727.1(1)^4}{4} + \frac{49374(1)^3}{3} - \frac{200448(1)^2}{2} + 259349(1)\right]$$

$$e_{2016} = [-2237191.77 + 5645094 - 4910976 + 1815443] - [174651.225]$$

$$e_{2016} = 137718$$

Combined Socioeconomic Impact of Variables in 2030 (e_{2030})

$$e_{2016} = \int_{n=1}^{n=7}(2285.1x^4 - 40203x^3 + 247041x^2 - 621741x + 564248)dx$$

$$e_{2016} = {}_1^7\left[\frac{2285.1x^5}{5} - \frac{40203x^4}{4} + \frac{247041x^3}{3} - \frac{621741x^2}{2} + 564248x\right]$$

$$e_{2016} = {}_1^7\left[\frac{2285.1(7)^5}{5} - \frac{40203(7)^4}{4} + \frac{247041(7)^3}{3} - \frac{621741(7)^2}{2} + 564248(7)\right] - {}_1^7\left[\frac{2285.1(1)^5}{5} - \frac{40203(1)^4}{4} + \frac{247041(1)^3}{3} - \frac{621741(1)^2}{2} + 564248(1)\right]$$

$$e_{2016} = [7681135.14 - 24131850.75 + 28245021 - 15232654.5 + 3949736] - [457.02 - 10050.75 + 82347 - 310870.5 + 564248]$$

$$e_{2016} = [511386.89] - [326130.77]$$

$$e_{2016} = 185256.12$$

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