The Behaviour of Construction Costs and Affordability in Developing Countries: A Yemen Case Study

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ABSTRACT:
Construction affordability is identified in Agenda 21 for Developing Countries as one of the main issues associated with sustainable construction and sustainable development. Despite international awareness of sustainable construction, the cost rates for construction activities and resources have been continuously increasing. Due to these increases the approaches to be used to achieve sustainable construction through efficient and affordable techniques can be difficult to determine.

This paper will examine the behaviour of the main construction costs and building rates, concurrently with socioeconomic behaviour, for the purpose of identifying some of the deficits in construction activities in developing countries, such as Yemen. This is achieved by examining past and current trends in the construction industry over the last two decades.

Comparisons with other developing and regional countries are established to allow for a scale of international development to be established. This scale, based on a proposed Construction Development Index (CDI), will enable the industry to be more responsive in relation to construction costs and affordability in a particular country.

Key words: Construction costs, affordability, socioeconomic indicators, developing countries, sustainability

INTRODUCTION

The construction industry and its activities have an important role to play in socio-economic development and quality of life. Construction activity accounts for more than 50% of the national outlays.

Building Construction costs registered an increase in rates year after year at scales much faster than inflation. It is seen that in view of the increase in cost for basic input materials like steel, cement brick timber and other materials as well as the cost of construction labour, buildings cost increase at around 20% to 30% annually even when inflation is in single digit.

Even though income levels of people are by and large brought in line with the levels of inflation through inflation indexed rise in salaries, year after year, housing is moving beyond the reach of the majority of the people. The reducing housing size for various categories in consecutive years in respect of the plinth areas, nature of specifications

even with increased income levels would indicate the rapid increase in cost of construction.

It stated by Ofori (2000) that the economies of many developing countries are currently confronted by severe difficulties owing to a combination of lower commodity prices, higher energy costs, falling exchange rates and rising inflation.

These issues must necessitate the need for using economical solutions and appropriate cost effective technologies and construction systems which can bring down the cost of construction within the affordability level of the people. This is one of the key issues identified in the Agenda 21 for sustainable construction in Developing Countries (CIB/UNEP-IETC, 2002) that is concerned with construction affordability and economic efficiency through national and international housing policies that ensure adequate, affordable and sustainable housing (United Nations Centre for Human Settlements, 1996).

This paper has two main objectives. The first objective is to monitor some key socio-economic indicators and construction cost in Yemen, and demonstrating that affordability is getting more difficult with time.

Second objective is to introduce a Construction Development Index (CDI) which can give a very simple and direct indicator for monitoring the affordability and construction cost development, which can be helpful for local and international comparisons. Comparisons are made with some other developing countries based on 1999-2000 data to see the relative behaviour of the construction rates and position.

CONSTRUCTION INDUSTRY AND THE ECONOMY

In nearly thirty years Yemen's economy has not significantly changed, and still is considered one of the least developed countries as classified by the United Nations (2002) and as a low income country by (World Bank 1999). Gross domestic product (GDP) per capita at current market prices had some increase from approximately US$ 215 in 1975 to US$ 420 in 1999/2000 "Table1" , an average growth rate of 2-4% annually - very slow in terms of local affordability and international prices growth.

The urban population growth has increased to 33% in (1994), from 9% in(1960) has made the need for adequate housing for low income people a very important concern of the Yemeni Government. However, the rush to respond to these needs seems to result in a low quality housing that does not adequately match the needs of these people (Djebarni & Al-abed 1998).

Turin (1973) suggested that unless the capacity of the construction industry of any country grew faster than the GDP the industry could constrain overall national socio-economic development. Also, Turin (1973) observed that the proportion of GDP contributed to the construction industry in the developing countries range between 3-5 %. This finding was confirmed by (Edmond and Miles 1984) and (Wells 1985), Hillebrandt (1985) has also stated that any reduction in purchasing power will similarly affect the construction industry, moreover if the output of the industry is down, total investment is down (Hillebrandt P 1985).

"Table1" Socio-Economic Indicators for Yemen

year	Population (million)	GNP US$	GDP/capita PPP (US$)	Exchange rate v US$	Inflation % pa
1990	11.876	664	1090	16.5-25	-
1991	13.411	520	1374	25	-
1992	13.854	-	-	32-36	-
1993	14.312	-	-	36-45	-
1994	14.785	280		45-69	-
1995	15.250	270	460	95-110	-
1996	15.692	260	552	110-126	40
1997	16.139	330	640	129.28-135	12
1998	16.599	360	740	135.8-140.9	-5
1999	17.5	370	720	155.7	8
2000	17.7	380	750	164.59	23
2001	18.078	420	820	166-172	20

(Ref. The World Bank Development reports)

Recent history, however, has demonstrated that it was not possible for the local Yemen construction industry to cope with the rapid growth in need for the modern forms of construction that have occurred over the past decades. The inadequacies of building materials as well as inadequacies in design and project management potential have been a further hindrance. Undue dependence on foreign consultants together with a lack of any approved national system of codes, standards or specifications have only compounded the industries problems. The results are that construction projects are often over-designed or inappropriate to local needs priorities (UNIDO/World Bank 1981).

Furthermore, in the early 1990's, the economic and social conditions in the country started to deteriorate noticeably due to many factors but mainly due to the reunification of Yemen in May 1990, which has caused even more confusion and chaos.

Key statistics on Yemen and its construction industry shows that value added in construction decreased to 4.2% in 2000 "Table 2". This is to support Turin's observation, since Yemen is lower income developing country. If the construction output should continue to stabilize as expected over the next few years, the contribution of the construction industry will continue to be ineffective in terms of the contribution to the economy and living standards.

"Table 2" Construction in the Economy of Yemen

	GNP per capita US$	Gross construction % of GDP	Employment % of EAP
*1975	215	8	4.7
#2000	420	4.2	6.6

(Ref. * Wells J. 1986, table 2.1 & # World Bank, 2002)

In countries where construction contributed 3–5% to GDP, an implication for development policy was that unless the construction industry grew faster than the economy as a whole it might constrain national development (Han and Ofori, 2001). The construction industry is a main contributor to the national economy, therefore the more developed the industry is the more the contribution to the economy. Similarly, a developing economy leads to more construction projects and purchasing power means affordable projects.

The interlink relation between the construction industry and the economy makes it clear that development can not occur without the other, although a growing construction industry does not necessarily mean a developing industry nor economy.

In fact, the increase in construction prices could cause an artificial indication of the contribution of the construction industry to the GDP and economy. Furthermore the increase in construction costs always occurs faster than the increase in the GDP/capita.

THE CONSTRUCTION LABOUR AND MATERIALS COSTS

"Table 3" indicates the costs of main construction materials delivered to site in the Sana'a area, as incurred by contractors. These assume small to medium sized construction projects at non constrained and non remote locations.

The table demonstrates the changes in the building costs since 1979/80 to 1999/2001. Building costs are the costs actually incurred by the builder/contractor in the course of his business the major ones being those of labour and materials.

The building costs table will reflect the fluctuations since 1979 in wages and materials costs to the builder.

"Table 3" The Construction Labour and Materials Costs (all figures in Yemeni Rial)

	construction cost	exchange rate	unskilled labour	cement	aggregate	ready mixed concrete	mild steel	hollow cement block
	YR/m2	vs. US$	YR/day	tonne	m3	m3	ton	1000
1980	3000	4.5	60	798	90-100	764	3000	325
1990	8000	16	260	3500	400	980	8000	1000
2000	47000	165	600	12000	1200	7500	47000	4500

(Ref. UNIDO/World Bank 1981 and field observations)

CONSTRUCTION COST PER UNIT AREA:

The building costs per unit area "Table 4" are averages incurred by building clients for standard family housing unit in Sana'a area. They are based upon the total floor area of all storeys, measured between external walls and without deduction for the internal walls.

Approximate costs generally include mechanical and electrical installations, but exclude furniture, loose or special equipment, and external works. They also exclude fees for professional services and permission fees. The costs shown are appropriate to local specifications and standards. This should be borne in mind when attempting comparisons with similarly described building types in other countries.

In less than two decades, the construction costs have increased from around 4,000 YR/m^2. to as high as 45,000 YR/m^2. This is in respect of the normal types of housing construction. Still higher levels of costs are registered for using better finishes and amenities.

Since 1979/80 to 1999/2000 wages in local currency have increased 10 times. The exchange rate and equally most construction prices by nearly 40 times (GNP and PPP per capita (in US$) stayed the same or changed insignificantly, which meant the construction cost is growing faster than the average income.

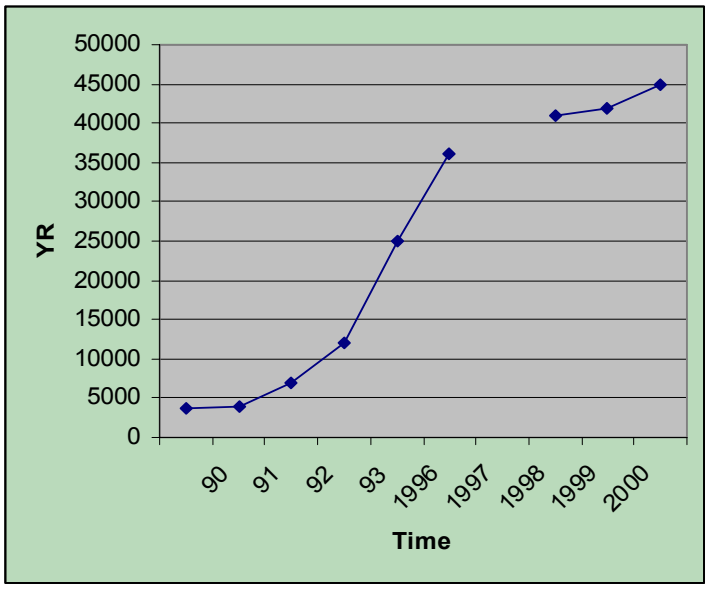
From 1989/1990 to 1999/2000 wages have increased by 4 fold, exchange rate by 10-11 fold , the GNP pc. The construction cost in local currency increased 11.7 times. This meant the close relation between cost and exchange rate.

"Table 4" The Variation of Construction Cost and GNP pc with Time

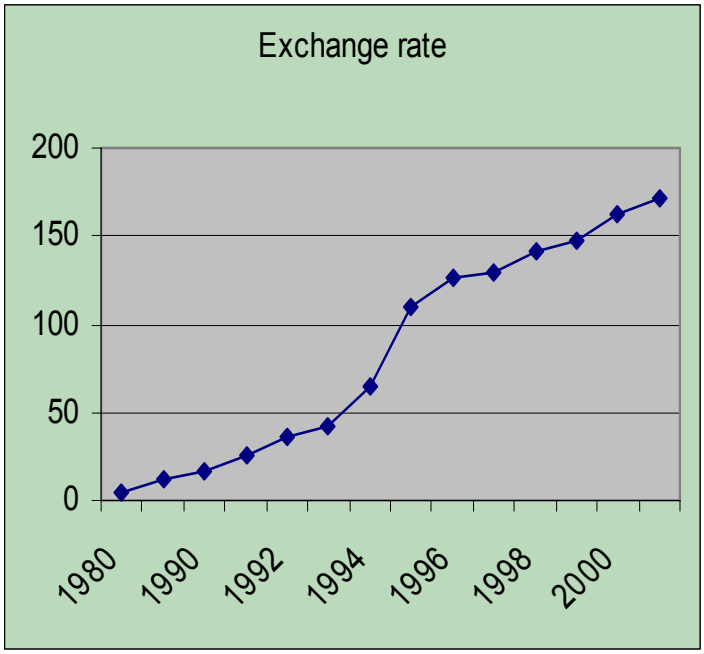
year	GNP pc	PPP	Construction cost	Construction cost
	US$	US$	US$/$m^2$	YR/m^2
1990	664	1090	273	4500
1991	520	1374	280	7000
1992	-	-	352	12000
1993	-	-	362-	25000
1994	280	-	-	-
1995	270	460	327	36000
1996	260	552	301	38000
1997	330	640	295	41000
1998	360	740	324	41000
1999	370	720	270	42000
2000	380	750	309	45000
2001	420	820	345	48000

(Ref. World Bank Development reports & field observations)

"Figure 1" & "Figure 2" show the sharp and steady increase in construction cost and exchange rate.

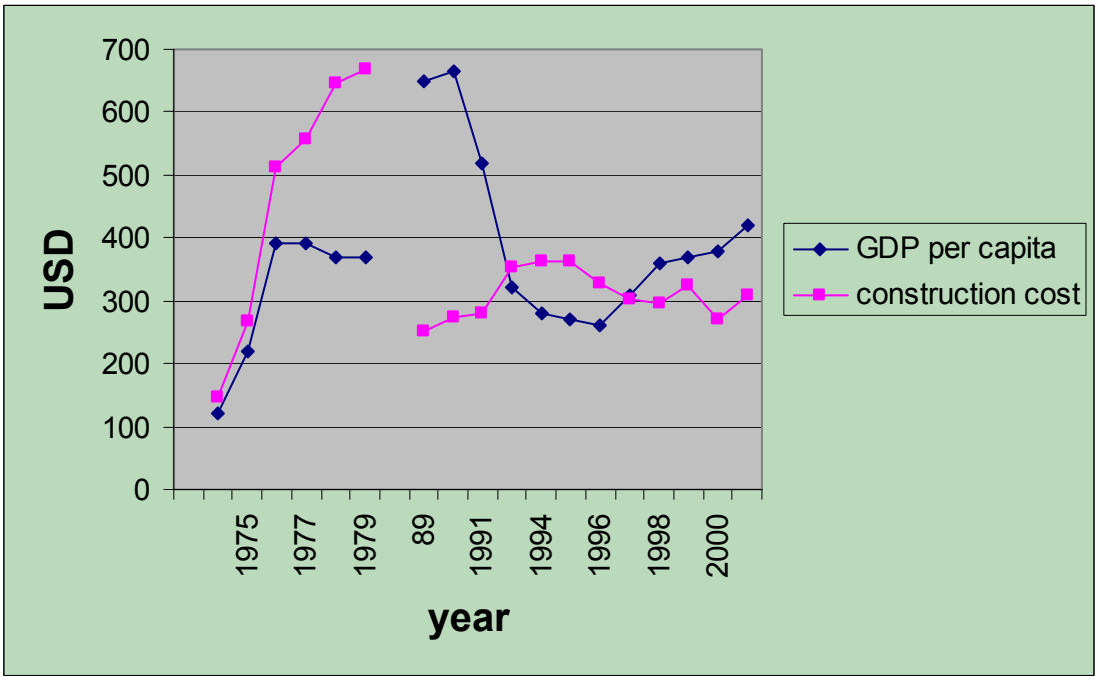


"Figure 1" Variation of Construction Cost in Local Currency (YR) with Time



”Figure 2” The Variation of Exchange Rate (YR) with time

“Figure 3” shows that only in late 1980s the GDP per capita was slightly above the construction cost, still this construction cost was being considered high.



”Figure 3” The Variation of Construction Cost and GDP pc with Time

CONSTRUCTION DEVELOPMENT INDEX: (THE AFFORDABILITY INDICATOR)

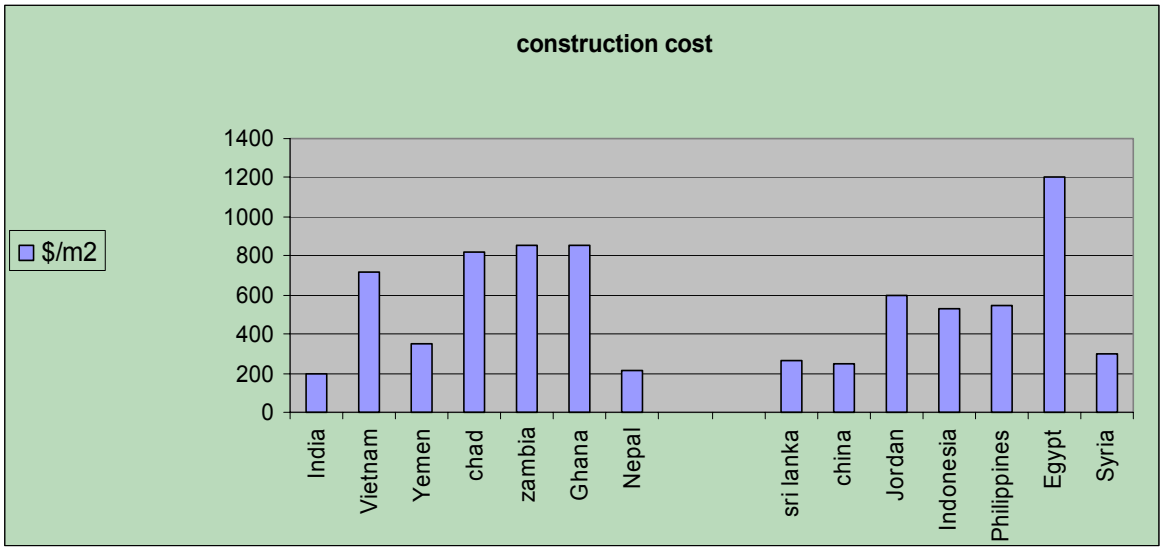
The implementation of any recommendations to improve the efficiency of the construction process will always take time. Additionally, the lack of reliable continuing statistics within the process will keep the monitoring hard to assess any development in the construction process. The search for simple construction development indicators will be the crucial factor for this predicament.

Chapter 40 of Agenda 21 (UNCED1992) calls for the development of indicators for sustainable development. In particular, it requested countries at the nation level, and international government and non-governmental organizations at the international level to develop the concept of indicators of sustainable development. It was also found that one of the key issues of the first meeting of the CIB Task Group 29 (1998) on construction in developing countries was to establish indicators for measuring construction industry development and performance. As noted by Ofori (2001) it was suggested by many organizations such as the Organization of Economic Cooperation and Development (OECD) that the indicator should be simple, easy to interpret, and able to show trends over time. It should also be responsive to changes. Similar argument can be found in Dalal-Clayton (1993) of National Strategies for Sustainable Development NSSD

One such "simple" indicator, which is often used, is the construction cost/m^2. This, however, is not always an appropriate index, because when it comes to international comparisons it does not reflect the local affordability.

"Figure 4" shows the construction cost (reinforced concrete framed family housing unit) for some countries selected from the UN and World Bank classification for the lower-to-middle income developing countries. This figure only indicates how the cost varies relatively from one to the other, but it does not show affordability for the local market.

In Yemen for the last few years the construction cost/m^2 has always been within the range of \$270/m^2 to \$340/m^2 for standard concrete frame housing unit and normal finishing. This value is considered high relative to the standard of living and in terms of quality to similar types of buildings in the neighbouring countries.



"Figure 4" Construction Costs/m^2 in some Developing Countries. (Ref. Spon's publications and others. Costs are taken here for demonstration purposes only).

This paper considers using the construction cost/m^2 alone as an inappropriate indicator for measuring and monitoring construction development as the index varies relative with time and location. Relating construction cost/m^2 to the PPP/capita appears to provide a more realistic and internationally comparative index.

Thus, this paper proposes a new development indicator which relates construction cost/ m^2 with a nation's Purchasing power PPP[1] pc:

Construction Development Index =

Applying the Construction Development Index (CDI) for a range of developing countries, as indicated in "Table 5" below, provides a system of more accurate and meaningful cross-country comparisons.

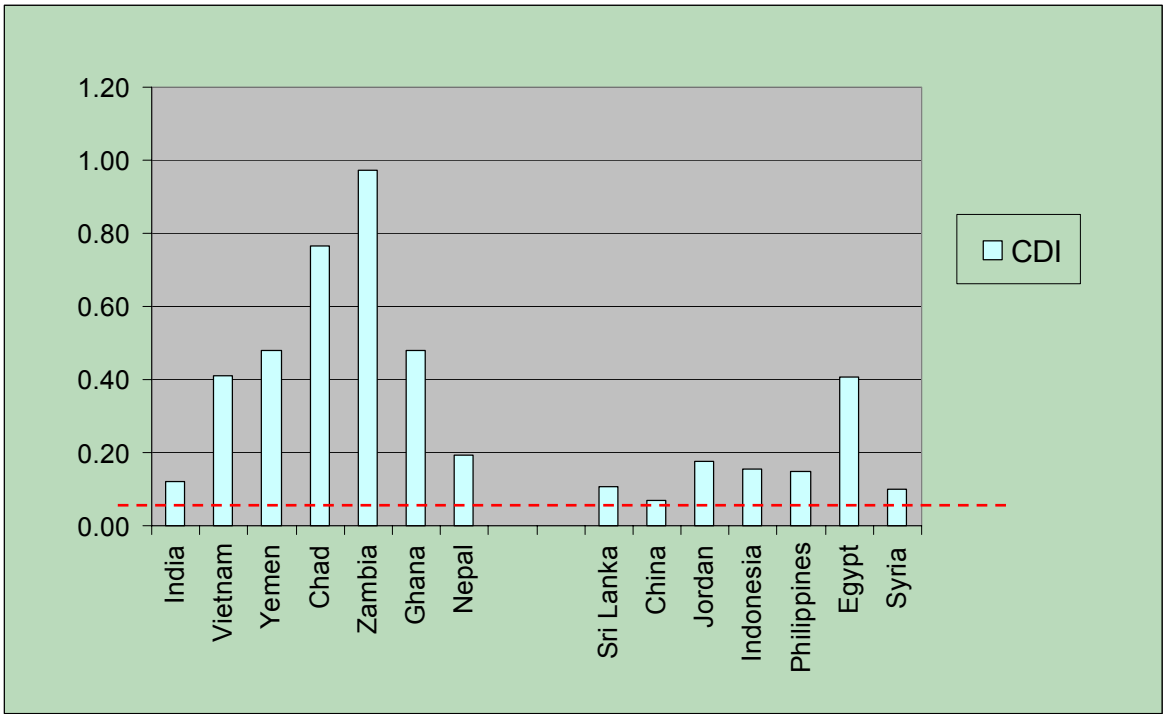
"Table 5" CDI for Developing Countries 98/99

		GNP pc US$	PPP US$	construction cost US$/m2	CDI
Low income Developing countries	India	390	1650	200	0.12
	Vietnam	320	1760	720	0.41
	Yemen	360	720	345	0.48
	Chad	360	1070	818	0.76
	Zambia	380	880	855	0.97
	Ghana	370	1790	855	0.48
	Nepal	210	1090	210	0.19
Lower-Middle income Developing countries	Sri Lanka	800	2460	262	0.11
	china	860	3570	250	0.07
	Jordan	1570	3430	600	0.17
	Indonesia	1110	3450	530	0.15
	Philippines	1220	3670	547	0.15
	Egypt	1180	2940	1200	0.41
	Syria	1150	2990	300	0.10

(Ref. GNP and PPP from World Bank Development reports & construction costs from various sources mainly Spon's and others)

From "Table 5" above and as illustrated in "Figure 5" , it can be seen that China has the lowest index value, so if for the sake of argument china is considered as having the least construction deficits and cost overruns (of the countries compared). The appropriate CDI benchmark that should be targeted is close to say 0.05. The portion of index above this benchmark CDI represents costs caused by country specific issues such as project deficits, wastes and inflation.

[1] The concept of purchasing-power parity (PPP) has two applications: it was originally developed as a theory of exchange rate determination, but it is now primarily used to compare living standards across countries.



"Figure 5" CDI for Developing Countries

CONSTRUCTION DEVELOPMENT INDEX AGAINST TIME IN YEMEN

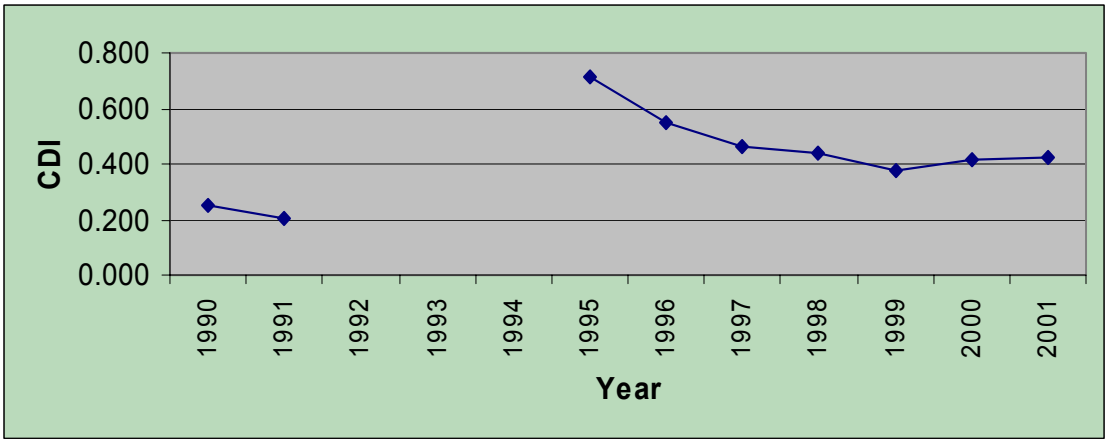
This CDI can be useful to monitor the local affordability with time. "Table 6" records the construction cost and purchasing power for the last ten year. Therefore, CDI shows if any development in construction activities that allowed and increase or decrease in affordability. This is illustrated in "Figure 6".

"Table 6" CDI against time in Yemen

year	GNP US$	PPP US$	construction cost US$/m^2	CDI
1990	664	1090	273	0.250
1991	520	1374	280	0.204
1992	320	-	352	-
1993		-	362-	-
1994	280	-	-	-
1995	270	460	327	0.711
1996	260	552	301	0.545
1997	310	640	295	0.461
1998	360	740	324	0.438
1999	370	720	270	0.375
2000	380	750	309	0.412
2001	420	820	345	0.421

(Ref. World Bank Development reports construction & costs from field observations)

The graph in "Figure 6" shows a slight improvement in affordability towards 1999, however this value still high in comparison to China or India as shown in "Table 6" and "Figure 5". This means the construction cost is still expensive against the local affordability and construction quality standards.



”Figure 6” CDI against Time in Yemen

SUSTAINABILITY AND AFFORDABILITY

The construction industry and its activities have an important role to play in socio-economic development and quality of life this is stated in the Agenda 21 for sustainable construction in Developing Countries (CIB/UNEP-IETC, 2002). The United Nations Habitat Agenda (1996) has also addressed the construction sector has a major role to play in terms of sustainable development and achieving adequate and affordable shelter.

One of the main barriers to sustainability and sustainable construction will be affordability. The construction industry in developing countries cannot afford to make any dramatic changes but has to start improving the existing technology and local resources it has.

The current situation of un-affordability, necessitates the need for using economical solutions and appropriate cost effective technologies, appropriate type of construction systems, optimum designs and construction materials which can bring down the cost of construction within the affordability levels of the people, as identified in the Agenda 21 for sustainable construction in Developing Countries, (CIB/UNEP-IETC, 2002), which concerns with construction economic efficiency through national and international housing policies that ensure adequate, affordable and sustainable housing. Authors such Adebayo (2000), McIntosh (2000) and Aboutorabi (2000) has addressed out that the sustainability development of the built environment is significantly linked to affordability, and affordability will remain a key barrier to sustainability.

CONCLUDING REMARKS

- It is suggested that to allow the execution of an efficient and sustainable construction activity within affordability conditions, the construction cost should be reduced or alternatively the GDP per capita is increased. The GDP must reach certain levels to allow a satisfactory and sustainable development of the construction activities through the purchasing power. This in return should allow the construction industry to positively start contributing to the economy and simultaneously to the living standards. Any reduction in purchasing power will similarly affect the construction industry.

- The development of the construction industry should lead to affordable construction activities and materials, which is one of the main issues of sustainability in the developing countries.

- It seems that the development of the construction industry to achieve efficiency, quality, affordability and then sustainability is strongly tied to the economy.

- Construction costs and activities in Yemen and other low income countries are unaffordable.

- CDI provides a useful means for allowing local and across country comparisons.

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