

NATIONAL HIGHWAYS CONSTRUCTION COST INDEX (NHCCI)

*Planning & Statistics Division
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National Highways Construction Cost Index

INTRODUCTION

Index is a measure of the change in a group of related variables over two different situations. Group of variables may be the prices of a specified set of commodities, the volumes of production in different sectors of an industry, the marks obtained by a student in different subjects and so on. Two different situations may be two different times, two different places etc.

Price indices in general combine prices of individual goods and quantity weights to track the percentage change in prices over time for a particular basket of goods. Implicitly, the quality of goods represented in a given time frame is assumed to be constant.

SOME IMPORTANT INDICES RELEASED IN INDIA

- Wholesale Price Index (WPI)
 - Compiled and released on monthly basis by the Office of Economic Adviser, DIPP, M/o Commerce & Industry.
- Consumer Price Index (CPI)
 - CPI (Urban) and CPI (Rural) – Released by CSO, M/o Statistics & PI
 - CPI (Industrial Workers) – Released by Labour Bureau, M/o Labour
 - CPI (Agricultural Labour) – Released by Labour Bureau, M/o Labour
 - CPI (Rural Labour) – Released by Labour Bureau, M/o Labour
- Index of Industrial Production (IIP)
 - Released by CSO, M/o Statistics & PI on monthly basis

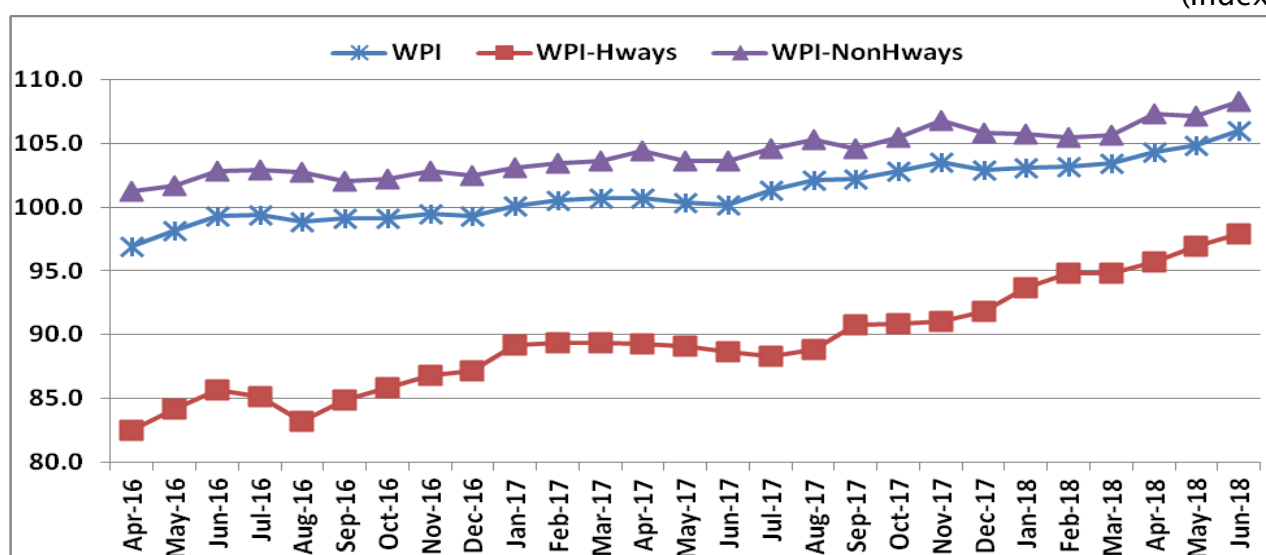
WHOLESALE PRICE INDEX (WPI)

The Office of the Economic Adviser in the Department of Industrial Policy and Promotion, Ministry of Commerce and Industry is responsible for compiling and releasing WPI every month. WPI is an important measure to monitor the movement of general level of prices in the economy. It is widely used by Government, banks, industry and business circles. In view of the importance of prices for the health of the economy, in terms of growth and distribution, the monetary policy of the RBI is often guided by the need of keeping prices within prudent limits. Similarly, the movement of WPI serves as an important determinant, in formulation of trade, fiscal and other economic policies by the Government of India.

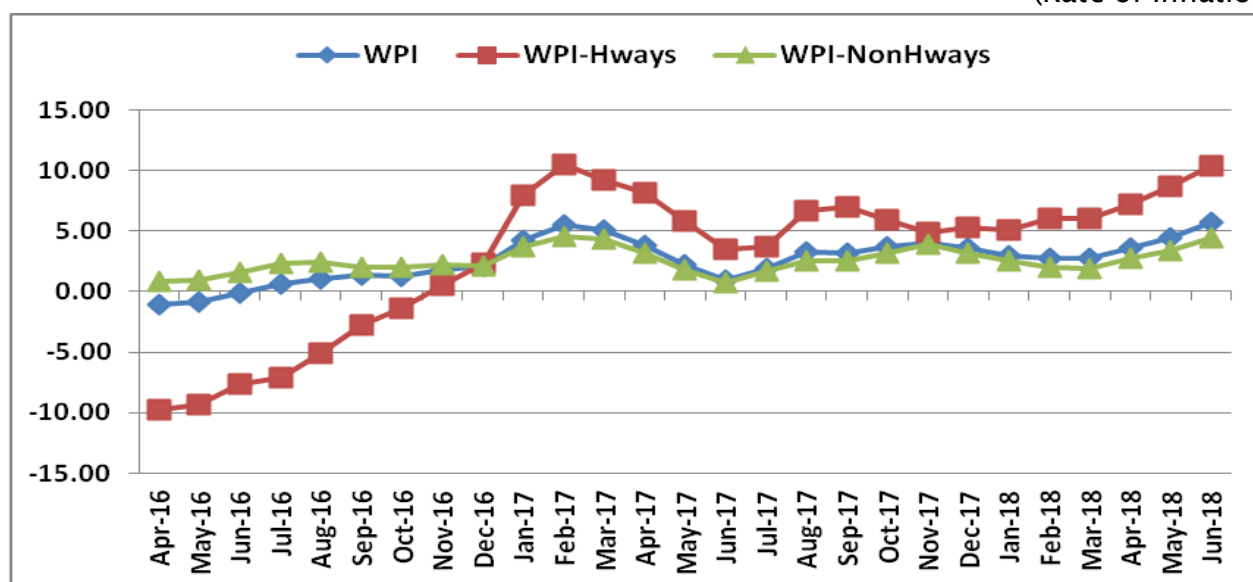
NEED FOR A SEPARATE INDEX FOR HIGHWAYS CONSTRUCTION

WPI is used in price escalation clauses for settling claims in many construction activities including road construction. But WPI as a whole is not a good reflector of movement of cost of highways construction. It is observed in the basket of WPI that only about 20% weight relates to highways items whereas 80% weight is for the items which are not concerned to highways construction. Therefore, overall WPI is highly influenced by the non-highways items and not a good representative index for highways construction cost. For comparison, items related to highways construction were isolated and separate index using WPI weights has been calculated as WPI-Hways and similarly for rest of the items as WPI-NonHways. Following graphs will depict last 2 year's movement of WPI, WPI-Hways and WPI-NonHways and Rates of Inflation based on these:

(Index)



(Rate of Inflation)



From above, it is clear that overall WPI is not moving in conforming to price movement of Highways items as non-highways items are having major weight and as such it would not be appropriate to use overall WPI for escalation purposes. Calculating separate index for highways construction cost by selecting a representative basket, deriving appropriate weighting diagram, collecting price data from field would have been ideal to overcome this problem. But, collection of primary data involves huge cost and manpower which may not be affordable by NHAI. Alternatively, it is suggested that a representative item basket for highways construction may be selected and proper weighting diagram may be derived based on average expenditure per unit length of road construction as available in NHAI and separate index is computed using this weighting diagram and available price data from secondary sources like IOCL, JPC etc and WPI of the related / linked items for others. For aggregates, equipments and labour, price data are to be collected from the Concessionaires / Contractors.

NHAI would compute this monthly index, viz. National Highways Construction Cost Index (NHCCI), every quarter and explore using the same for escalation purposes instead of using overall WPI.

CHOICE OF BASE PERIOD

Base period of an Index Number should be a normal period in the recent past and it should not be too short or too long. It should be a period for which reliable figures are available.

Since the highways construction cost data available was for 2013-14 which is a normal period in recent past, base period of NHCCI has been taken as 2013-14. Base period should be revised every 5th year.

CHOICE OF COMMODITIES

As it is practically impossible to include information of all commodities of an economy, a representative commodity basket is selected for compilation of index number. Selection of commodities is done by judgment sampling keeping in consideration that quality of the selected commodities should not vary much from period to period, and no commodity should disappear from the market. Reliable figures should be available for the selected commodities.

A representative Basket for NHCCI has been selected based on average cost data available with NHAI for 10-km stretch roads. As the number of items required for road / bridge construction is not very large, we have taken all the items and their expenditure initially and then grouped them step by step keeping in mind homogeneity, similarity, sympathetic price movement and possible linkage with some item in WPI basket. The item basket thus selected is as below:

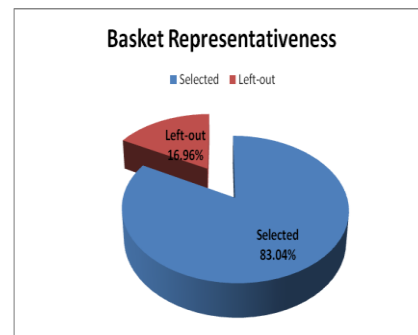
Sl. No.	Item	Data Source / WPI Link	Items merged
1	Aggregate	Concessionaire / Contractor	All type of aggregates, dust and filler, Sand, Stone / Stone spall
2	Bitumen	IOCL	Bitumen emulsion / VG 30 / VG40
3	Cement	WPI (Cement & Lime)	Cement , Admixture
4	Steel	JPC	TMT Bars /HT Strand / Structural Steel, road side barrier
A	MATERIAL		
	Petrol	IOCL	
	Diesel	IOCL	
B	FUEL		
C	EQUIPMENT	Concessionaire / Contractor	All types of equipments (hiring charges)
D	LABOUR	Concessionaire / Contractor	Skilled / unskilled / semi-skilled

DERIVATION OF WEIGHTING DIAGRAM

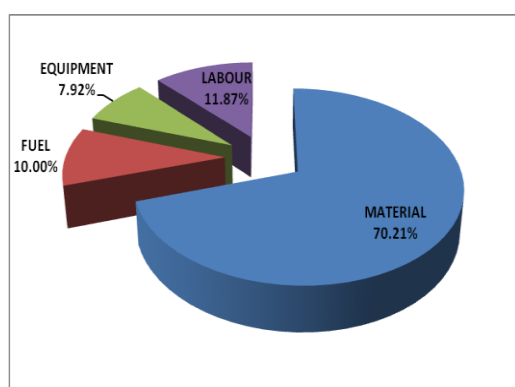
For derivation of weighting diagram, item wise cost in terms of value for construction of a unit length of road / bridge as available in NHAI has been used. The unimportant items with negligible weights have been dropped and their weights have been proportionately distributed among the other items. As said before, similar items have been merged. The selected items and their weights are as below:

Sl. No.	Item	Weight (%)
1	Aggregate	37.16163
2	Bitumen	18.55758
3	Cement	4.33235
4	Steel	10.16265
A	MATERIAL	70.21421
	Petrol	1.89251
	Diesel	8.10749
B	FUEL	10.00000
C	EQUIPMENT	7.91936
D	LABOUR	11.86643
	TOTAL	100.00000

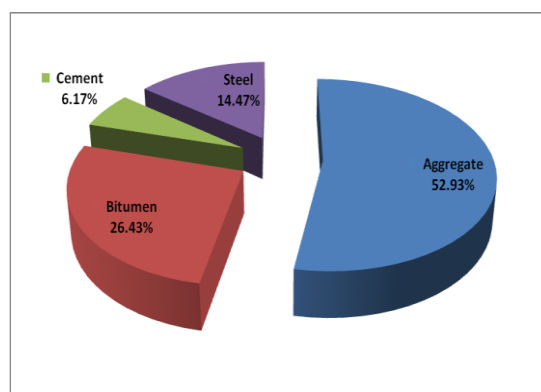
Weights of (i) Fill Material (Soil), (ii) Bearing & Expansion Joint, (iii) Traffic Sign & Marking, (iv) Street Lighting, (v) Toll Plaza & Equipment, (vi) Median plant, (vii) sapling of trees, (viii) HTMS equipment and (ix) bus shelter material have been proportionately distributed amongst the selected items in MATERIAL group. Considering the left-out items for which weights have been added with similar selected items or proportionately distributed amongst other selected items, basket representativeness is about 83%.



Group wise share of weights in the basket and item wise share of weights in Material group may be seen in the following graphs.



Complete Basket



MATERIAL Group

CALCULATION

In the majority of countries, the index numbers are computed using Laspeyre's formula as it is simple to calculate and the necessary data can be easily obtained. NHCCI is also calculated using Laspeyre's formula as below:

$$I = \frac{\sum_{i=1}^{i=k} w_i I_i}{\sum_{i=1}^{i=k} w_i}$$

Where

I = Index Number of a group / All commodities

I_i = Index Number of an item / group

w_i = The weight assigned to the i^{th} item / group

k = number of items / groups in the group / all commodities

Price relatives are calculated as the percentage ratios, which the current prices bear to those prevailing in the base period, i.e., by dividing the current price by the base period price and multiplying the quotient by 100. Price relatives are used to neutralize the unit effects. The commodity index is arrived at as the simple arithmetic average of the price relatives of all the varieties included under that commodity. The indices for the groups / all commodities are, in turn, worked out as the weighted arithmetic mean of the indices of the items / groups falling under their respective heads.

SOURCES FOR PRICE DATA

As mentioned above, secondary sources e. g. JPC and IOCL have mainly been selected for collection of price data for the items of commodity basket. For some items like aggregates, equipments and labour, primary data are collected from the concessionaires / contractors involved in road construction works. The details sources for price data are as below:

Sl. No.	Item	Data source	Remarks
A	MATERIAL		
1	Aggregate	Concessionaires / Contractors	317 quotations from 35 sources
2	Bitumen	IOCL	Bitumen (bulk) prices are taken from IOCL for Mumbai, Kochi, Koyali, Mathura, Panipat, Haldia and Chennai Refineries
3	Cement	OEA, DIPP	WPI of Cement & Lime is taken from OEA
4	Steel	JPC	JPC collects and compiles fortnightly price data for 30 items for Kolkata, Delhi, Mumbai and Chennai
B	FUEL		
1	Petrol	IOCL	Petrol prices are taken from IOCL for Mumbai, Kolkata, Delhi and Chennai
2	Diesel		Petrol prices are taken from IOCL for Mumbai, Kolkata, Delhi and Chennai
C	EQUIPMENT	Concessionaires / Contractors	613 quotations from 24 sources
D	LABOUR	Concessionaires / Contractors	111 quotations from 36 sources

REVISION OF INDEX

Conforming to standard United Nations guidelines for index numbers, revision of NHCCI can be done every five years. As it is in-house activity, it would be easier for NHAI to revise every five years.

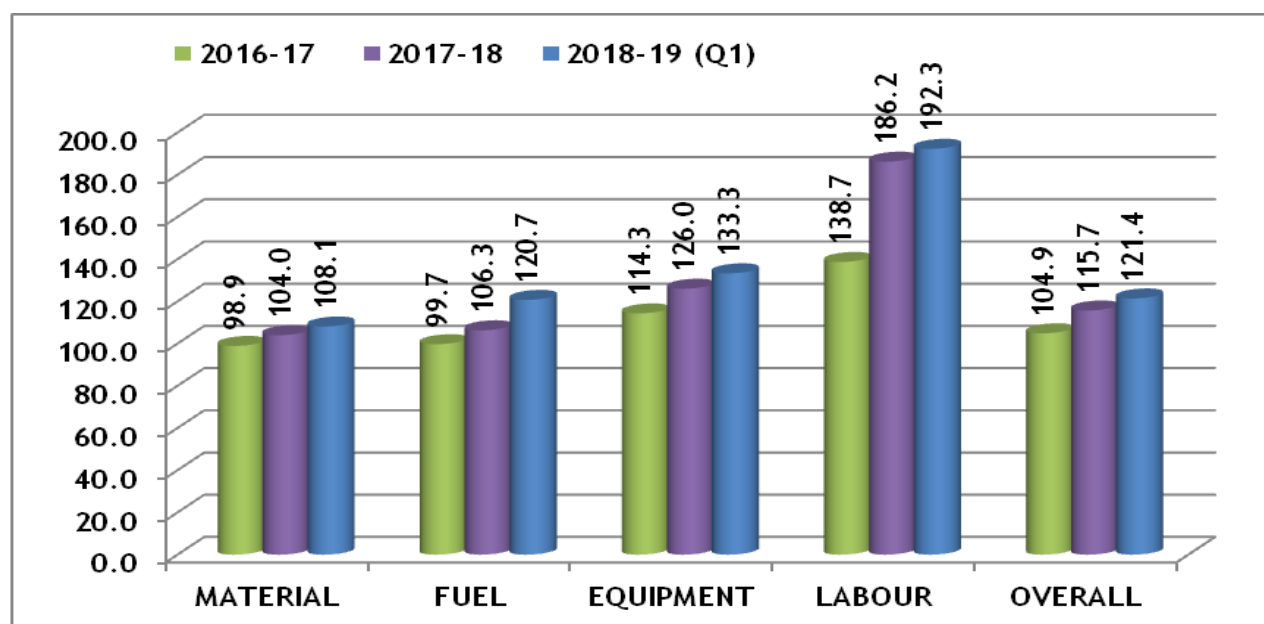
COMPILATION OF NHCCI UPTO JUNE 2018

Based on methodology stated in the Manual and price data received from the pre defined sources, NHCCI up to month of June 2018 has been calculated. Component wise NHCCI for financial year 2014-15, 2015-16, 2016-17, 2017-18 and 2018-19 (till June) is given in the following table:

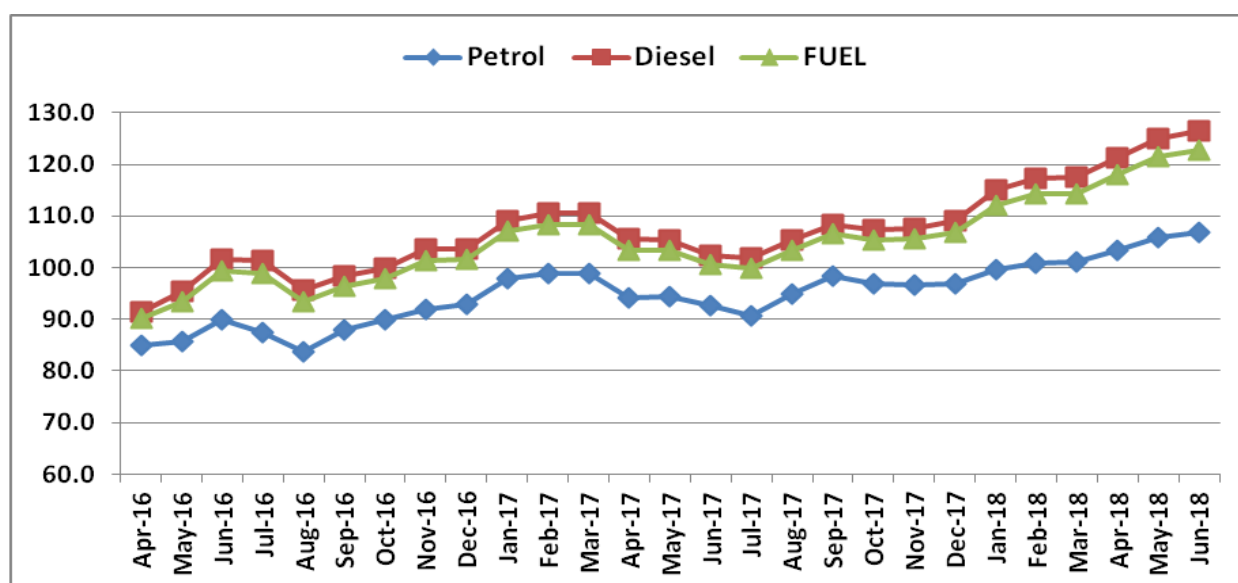
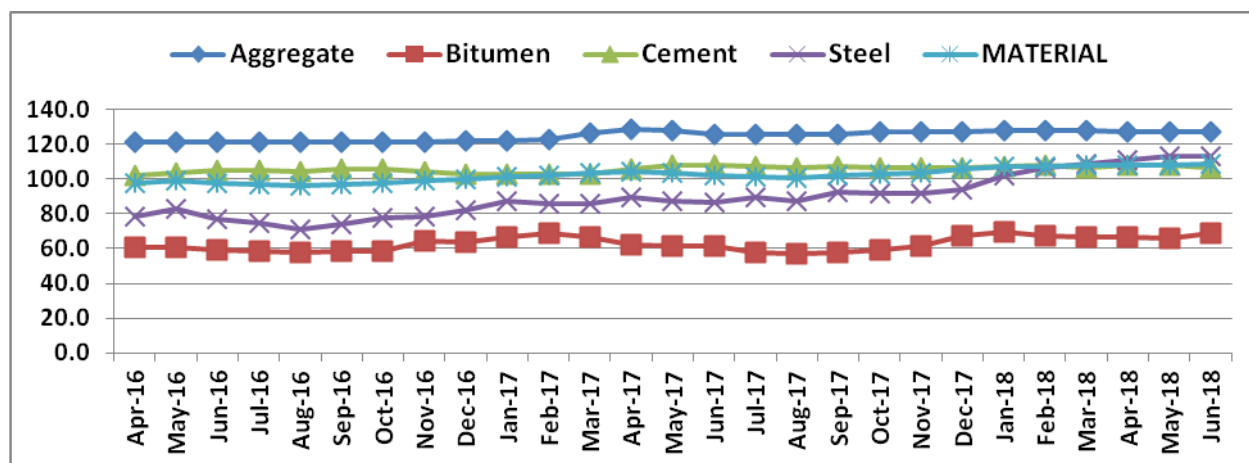
[Base: 2013-14 = 100]

SN	Item	Weight	2014-15	2015-16	2016-17	2017-18	2018-19 (till June)
1	Aggregate	37.16	111.4	118.3	122.1	127.1	127.5
2	Bitumen	18.56	95.0	69.2	62.0	62.6	67.1
3	Cement	4.33	104.2	103.3	103.9	107.0	107.4
4	Steel	10.16	94.3	78.4	79.6	93.9	112.5
A	MATERIAL	70.21	104.2	98.7	98.9	104	108.1
	Petrol	1.89	95.2	87.0	90.8	96.4	105.3
	Diesel	8.11	104.0	89.5	101.8	108.6	124.3
B	FUEL	10.00	102.4	89.0	99.7	106.3	120.7
C	EQUIPMENT	7.92	103.1	108.3	114.3	126	133.3
D	LABOUR	11.87	117.5	129.0	138.7	186.2	192.3
	TOTAL	100.00	105.5	102.0	104.9	115.7	121.4

NB - FY index is simple arithmetic mean of 12 monthly indices



Component wise movement of MATERIAL and FUEL groups from April'16 onwards are as below:

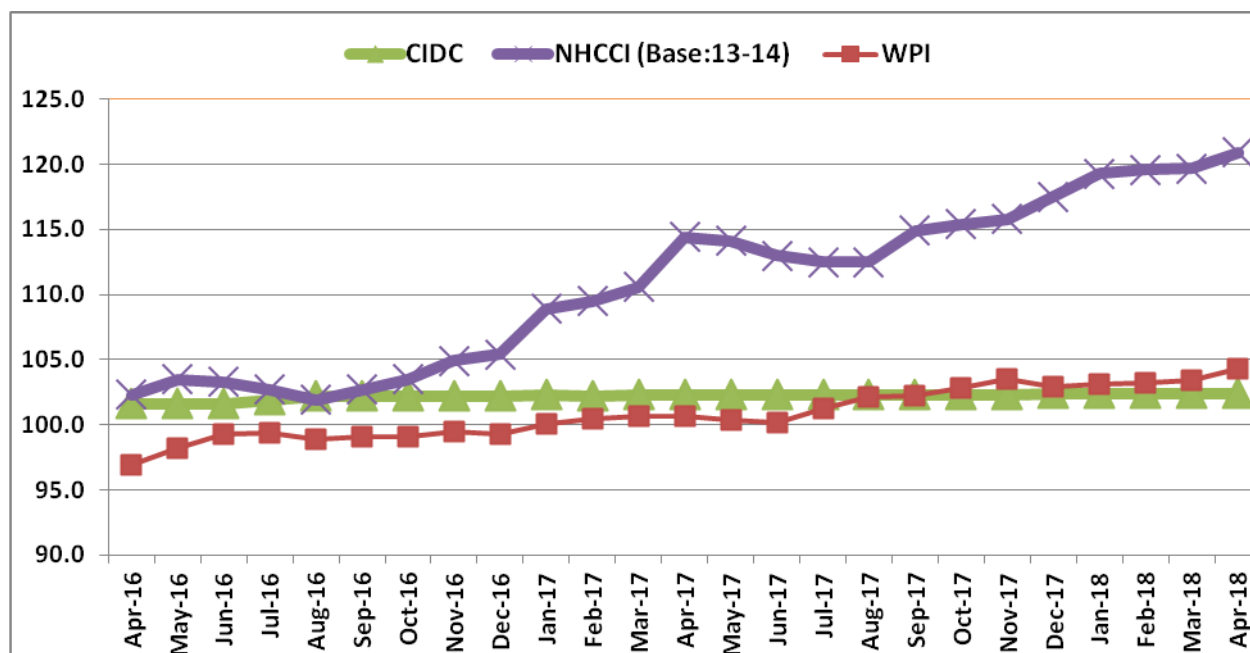


COMPARISON OF NHCCI WITH OTHER INDICES

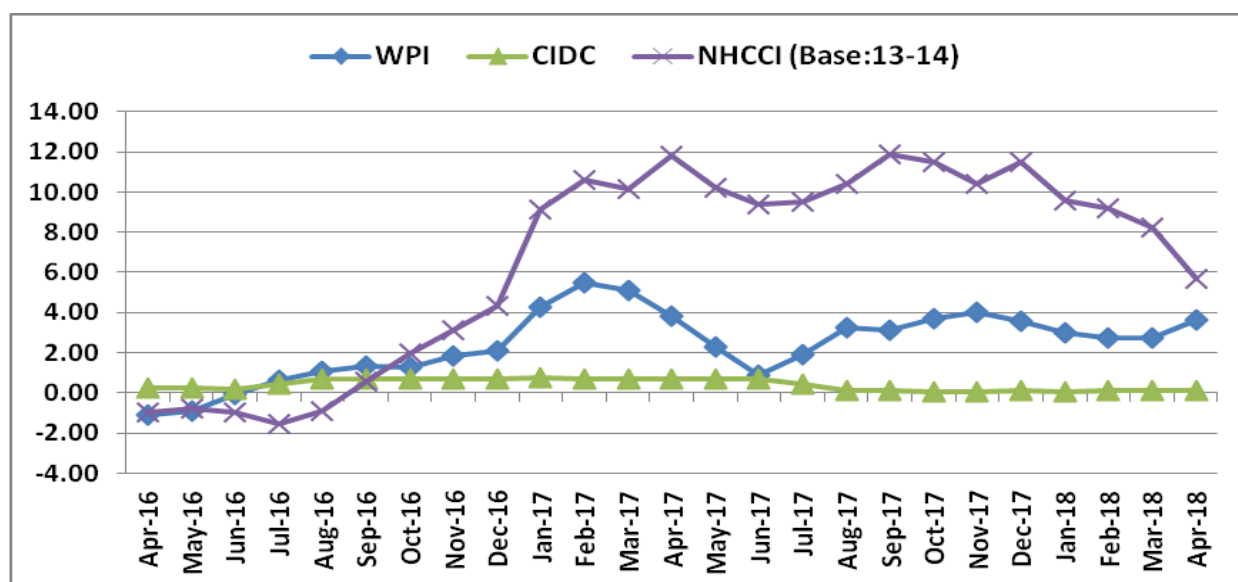
Construction Industry Development Council (CIDC)

CIDC compiles and releases indices every month separately for Building, Road, Bridge, Dam, Power, Railway, Mineral Plant, Medium Industry, Transmission, Urban Infra and Maintenance. Base period for this index is October 2007 and index is released for 78 markets. Indices are not integrated and State wise and All India index is not compiled and released. These indices are uploaded in CIDC website: <http://www.cidc.in>. Item basket, weighting diagram used for compilation of index and name of the agencies from which price data are collected are not disclosed in the website.

However, CIDC indices have been downloaded from the website and made a comparison with WPI and NHCCI as below:



It may be seen that movement of CIDC index is almost constant whereas WPI and NHCCI are showing fluctuations conforming to market condition. It may, thus, not be well representative for highways construction cost index. The rates of inflation based on CIDC also remain almost constant as may be seen below:



Keeping the above points in view, CIDC index may not be appropriate and well representative for use in highways sector.

Central Public Works Department (CPWD)

For escalation clauses of buildings, CPWD is using following weighting diagram:

Sl. No.	Material	Weight (%)	Remarks
1.	Cement	14.5	34.0% -- considered for 10CA
2.	Steel	19.5	
3.	Brick	10.5	30.17% -- considered for 10CC
4.	Aggregate	7.0	
5.	Sand	3.0	
6.	Paint	3.0	
7.	Wood product	5.0	
8.	Pipes (civil)	1.67	
9.	Pipes (Elec)	0.83	10.83% -- considered by Elec Wing
10.	Lamps & Fans	3.5	
11.	Electric machinery	2.5	
12.	Wire & cables	4.0	
13.	Labour (Civil + Elec)	25.0	Both by Civil & Elec.

For growth rate, base price of each item and current price are decided based on market / negotiation from time to time. For some items, market prices are considered, while for some other items, WPI are used. In brief, as CPWD index is basically for buildings, it won't be helpful for highways cost index.

CONCLUSION

NHCCI based on above methodology may be used for escalation in highways construction sector as there is no other better index available.

-X-X-X-X-