Discussion Paper 2.0: Adoption of Chain-Based Index of Industrial Production (IIP)

1 Background and Objective

1.1 The Index of Industrial Production (IIP) is a key short-term economic indicator used to monitor industrial activity and guide macroeconomic policy. Traditionally, the IIP has been compiled using a fixed-base Laspeyres framework, in which sectoral and industry weights remain unchanged until a base-year revision. Over time, production shifts in response to demand, technology, and policy changes. Some industries expand, while others decline or disappear, and entirely new industries or production lines within an industry may emerge. Therefore, fixed weights become progressively less relevant, leading to substitution bias and distortions in growth estimates and the indices increasingly suffer from weight obsolescence, reducing their ability to accurately reflect current economic conditions.

1.2 In this context, the Technical Advisory Committee for Base Year Revision of All-India Index of Industrial Production (TAC-IIP) has debated at length the current fixed-based methodology of computing the index and the limitations arising from this methodology. In an era of rapid innovations, technological transformation, market demand and supply shifts and repeated redrawing of supply chain networks, the weights quickly become outdated. Conceptually, the chain-based method offers better accuracy by capturing these changes by allowing the increase and decrease in weights annually to correctly reflect a more recent production structure. These aspects along with the challenges in the chain-linked indices have been brought out in this Discussion Paper with a view to elicit stakeholders' feedback on the methodology for the Chain-Linked IIP.

1.3 Before presenting the methodology for chain-linking, this paper briefly outlines international recommendations and country practices on chain-based indices, followed by the data constraints relevant in the Indian context.

2 International Recommendations on Chain-Based Indices

2.1 International statistical standards and manuals, like the International Recommendations for Index of Industrial Statistics (IRIIP 2010), OECD manual on compilation of an Index of Service Production (2007), recommend chain-linked volume indices for short-term business indicators like IIP and ISP. An article titled *Short-term business statistics and (annual) chain linking* by Eurostat also reflects similar opinion. This preference reflects several key advantages of chain linking:

i) Enhanced representativeness of industrial structure – Chain linking permits more frequent updating of weights ensuring that the IIP more accurately reflects evolving changes in the composition of industrial output.
ii) Mitigation of substitution bias – Regular weight updates allows the index to capture shifts in production patterns across industries and products, reducing distortions that arise from prolonged use of outdated weights.
iii) Improved accuracy in measurement of growth – By employing relatively recent weights chain linked indices provide more precise estimates of short-term movements in industrial activity and underlying growth dynamics.

2.2 Limitations of Chain-Linking

2.2.1 One of the main drawbacks of a chain-linking approach to compilation of IIP is the lack of the additivity characteristic. That is to say that the higher level or aggregate level indices would not be the exact sum of its components. In an IIP context, this means that the lower-level indices, say, of NIC 4-digit level, do not sum with respect to upper-level indices of NIC 3-digit level and so on.

2.2.2 Another drawback of the chain-linked approach arises in cases where individual prices or quantities fluctuate so that the relative prices or quantity changes occurring in earlier periods are reversed in later periods. Chaining in such periods of oscillations or "bounce" can lead to considerable index drift. That is to say that, if after several periods of "bouncing", prices and quantities return to their original levels, a chained index will not normally return to unity.

2.2.3 However, the underlying economic forces that are responsible for observed long-term changes in relative prices and quantities, such as technological progress and increasing incomes, do not often go into reverse.

2.2.4 The improved temporal accuracy of chain-linking sometimes comes with reduced temporal comparability. While capturing the current economic reality better, chain-linking introduces complexities that can complicate direct comparisons between different sub-sectors or historical periods.

2.3 Country Practices: Many statistical systems including the United States, United Kingdom, Australia and members of the European Union have already transitioned to chain-based indices with variations in revision frequency depending on data availability at national level.

3 Need for introducing Chain-linked Indices in India:

3.1.1 In fixed base-2011-12 IIP compilation methodology currently in use, higher-level indices are constructed by summing up weighted lower-level indices; the weights of the lower-level indices reflect the economic structure such as at NIC2/3/4 digits of industrial classification. For example, the total industrial production index is the sum of the weighted indices for the various industrial sectors (mining, manufacturing, electricity) and the weights reflect the different importance of the industrial sector.

3.1.2 If the base year is not revised frequently and the weights used for the index compilation are kept constant over a longer duration (fixed base indices) the real economic structure will over time move away from the structure represented by the weights. In India, trends in the weights at sectoral level and NIC 2-digit level over 2011-12 to 2023-24 were analysed (**Annex-1**) and it is observed that there are significant changes in the distribution of weights at these levels. These changes will be much more pronounced at further lower levels which makes it amply clear that representativeness of fixed weights goes down significantly as we move away from the base year. It is, therefore, imperative that the base year of the IIP should be revised frequently to update the weights and to introduce new products in keeping with the changing industrial composition.

3.1.3 Alternatively, as per international recommendations, the method of chain-linking may be used wherein the weights can be updated on an annual basis and the products should be updated at least once every five years to incorporate new products and reflect the evolving importance of product groups within the industrial sector. Chain-linked indices obviate the need for keeping the weights fixed and reduces the revisions at the time of rebasing of the index.

4 Data Sources and Finalization Lags in the Indian Context

In India, the weights for compilation of chain-based IIP weights would rely on two primary data sources:

4.1 National Accounts Statistics (NAS) – Gross Value Added (GVA) for sectoral weights

For a given financial year NAS estimates are finalized with a lag of about two years, as per the following schedule **(illustrated for FY 2022-23**):

First Advance Estimate*: 6th January 2023*

Second Advance Estimate*: 28 February 2023*

Provisional Estimate*: 31 May 2023*

First Revised Estimate*: 28 February 2024*

Thus, final NAS-GVA for sectoral weight of IIP becomes available only after a two-year lag.

4.2 Annual Survey of Industries (ASI) – GVA at NIC-2/3/4 Digit

ASI provides detailed industry-level GVA required to distribute manufacturing sector weights. For a given year, ASI GVA estimates typically become available with a lag of about 1.5 years. For example, ASI GVA for FY 2022-23 became available during September–October 2024.

These inherent lags critically influence the design of any chain-based IIP framework.

5 Methodology for Chain-linked IIP

5.1 The annual chained index updates the weights every year e.g. for the comparison between 2011 and 2012 the weights from 2011 are used, for the comparison between 2012 and 2013 weights from 2012 are used and so on. Each year is compared with the previous year on the basis of weights which are just one year old. The main principle underlying the concept of chaining is to generate Chain Link (CL) for a year by using the weights of the previous year and each index value is produced on the basis of actual chain link and the previous index. So, the index value (I) for a year t is produced by

$$I_t = CL_t \; X \; CL_{t-1} \; X \; CL_{t-2} \; X \; CL_{t-3} \; X \; CL_{t-4} \; X \; CL_{t-5}$$

The chain ends with the reference year (e.g. t-5) for which the index value is set, by convention, to 100.

5.2 Typically, since short term indices like IIP or ISP are compiled at quarterly or monthly frequency and the weights are generally only available on an annual basis, three techniques are recommended to combine them with annual weights as under:

a. Annual Overlap Technique – In the annual overlap method, the indices for a certain quarter/ month are weighted with their (annual/ average) weights of the previous year and set in relation to the weighted annual average Indices of the previous year. This technique is generally preferred as it ensures that monthly/quarterly indices aggregate exactly to the corresponding direct annual index.

b. One-quarter/ month overlap method – In the one-quarter overlap method, the indices for a certain quarter/ month are also weighted with their (annual/ average) weights of the previous year but are set in relation to the weighted last quarter/ month of the previous year. For obtaining an index this chain link is multiplied with the index for the last quarter of the previous year.

c. Over-the-Year Technique – In the over-the-year method, the indices for a certain quarter/ month are also weighted with their (annual/ average) weights of the previous year but are set in relation to the corresponding weighted quarter/ month of the previous year. The index is calculated by multiplying this chain-link with the corresponding quarter of the previous year.

Details of these techniques are presented in **Annex-2**.

6 Proposed Methodology for Annual Revision of Weights

6.2 Taking into account the international practices, data availability constraints and based on Technical Advisory Committee deliberations the approach for distribution of weights for compilation of chain-based IIP is presented for stakeholder consultation.

6.3 Sectoral and industry weights are revised every financial year (from April) using the latest available NAS and ASI GVA estimates, even if these are not final.

➢ Calculation of Sectoral weight

6.3.1 Sectoral weights for Mining, Manufacturing, and Electricity are derived from the Gross Value Added (GVA) in the National Accounts Statistics (NAS) for the latest available year, i.e. period *t-1,* even if the data is provisional:

I. Mining:

$$\text{Weight (Mining)} = \frac{\text{GVA of the Mining sector }_{t-1}}{\text{Total GVA (Mining + Manufacturing + Electricity)}_{t-1}} * 100$$

II. Manufacturing:

$$\text{Weight (Manuf.)} = \frac{\text{GVA of the Manufacturing sector }_{t-1}}{\text{Total GVA (Mining + Manufacturing + Electricity)}_{t-1}} * 100$$

III. Electricity:

$$\text{Weight (Electricity)} = \frac{\text{GVA of the Electricty sector}_{t-1}}{\text{Total GVA (Mining + Manufacturing + Electricity)}_{t-1}} * 100$$

➢ Calculation of weights for NIC 2 -Digit Level:

6.3.2 Share of the GVA for a particular 2-digit Industry *i* from available ASI data.

$$W_i = \frac{GVA_{i,t-1}}{\sum_i^n GVA_{i,t-1}} * Weight\ of\ Manufacturing\ sector$$

Where,

$GVA_{i,t-1}$ is the of GVA of i[th] industry Division NIC 2-Digit at period *t-1*

n = the number of 2-Digit NIC divisions under the scope of IIP. Here *n*=23

$\sum_i^n GVA_{i,t-1}$ is the sum of GVA of all 2-digit industries (NIC 10 to 32) at period *t-1*

6.3.3 In a similar manner the **weights for NIC 3 & 4 -Digit Level** are calculated.

Note:

- The NIC 2/ 3/ 4 Digit weights would pertain to the period *t-3* at the initial stage due to the lag in ASI data. The weights would be revised along with the availability of ASI data for the subsequent years. The final industry level weights would be referenced to the period *t-1*
- It is to be noted that the sectoral weights would undergo changes with the revisions in NAS data for the year.

➢ **Calculation of weights at Item level**

6.3.4 For the calculation of weights at the item level, it is assumed that the relative importance of the items remains unchanged over time. Thus, the NIC 4-Digit level weights are distributed in the item level in proportion of the original weights of the items. Although, the relative item level weights remain unchanged, the absolute weights change every year due to the change in the higher-level weights.

➢ **Calculation of Item Level Indices**

6.3.5 For the purpose of calculation of the item level indices, the monthly production data is first deflated using the WPI indices wherever required, i.e., where the production data is collected in value terms (Details of the deflation methodology may be seen at Annex-3). Then the item level production relatives are calculated using the following formula.

$$R_{i,t} = \frac{P_{i,t}}{P_{i,0}}$$

Where,

R_i= Relative production of item *i* at time *t*

$P_{i,t}$= Production (Deflated production where required) of item *i* at time *t*

$P_{i,0}$= Production of item *i* in base year

6.3.6 The item level indices are then calculated by multiplying the relative productions (R_i) by 100.

6.3.7 Since the chain-linked item level indices are derived by multiplying them with the item level indices of the previous period, they will remain unchanged for both fixed-base and chain-linked indices. This is demonstrated below:

The production relative for fixed base index may be seen in para 5.2.5 above.

The chain linked item level index is calculated as

$$I_{i,t} = \frac{P_{i,t}}{P_{i,t-1}} X \frac{P_{i,t-1}}{P_{i,t-2}} X \dots\dots X \frac{P_{i,2}}{P_{i,1}} X \frac{P_{i,1}}{P_{i,0}}$$

Or, $I_{i,t} = \frac{P_{i,t}}{P_{i,0}}$

- **Calculation of NIC 5-Digit level Indices**

6.3.8 The NIC 5-Digit level indices for a month are first calculated from the item level indices using the updated weights for the previous year (*t-1*). The item level indices are aggregated using the formula

$$I_m = \sum \frac{I_{i,m} W_{i,t-1}}{\sum W_{i,t-1}}$$

Where,

I_m= Index at NIC 5-Digit level for month *m* with weights for the previous year (*t-1*).

$I_{i,m}$ = the index for the item *i* in month *m*

$W_{i,t-1}$ = the weight of item *i* for the period *t-1*

These indices are then linked with the previous years' index using the annual overlap technique as described in Annex-2.

- **Calculation of higher-level Indices**

6.3.9 The method explained above is to be used for calculation of chain-linked indices at higher levels of NIC (4-, 3-, 2-Digits), sectoral levels and the General Index.

6.3.10 Illustrative Example: Compilation of IIP for FY 2025-26 (Starting April 2025)

The revisions that would take place due to revisions in weights are illustrated below:

Sectoral weights:

By April 2025, the Second Advance Estimate of NAS-GVA for FY 2024-25 were available. These estimates (*t-1* year, not final) were used to assign sectoral weights.

Manufacturing industry (NIC-2/3/4) weights:

The sectoral weights are distributed using ASI GVA for FY 2022-23 (*t-3* year), the latest available ASI data.

Compilation of indices:

Quick and revised monthly indices for April 2025 are compiled using the above weights. All months from April 2025 to March 2026 continue to use the same weight structure.

Subsequent revisions:

With availability of ASI for FY 2023-24 data (in September/ October 2025) and revised NAS estimates for FY 2024-25 (First Revised Estimates in February 2026), indices for FY 2025-26 are revised in April 2026 using updated weights (*t-1* sectoral, *t-2* NIC 2-/3-/4-Digit).

Final indices for FY 2025-26 are calculated using updated weights in April 2027 after final NAS GVA and ASI data for FY 2024-25 become available (*t-1* sectoral, *t-1* NIC).

6.4 Implications

- Each monthly index undergoes three revisions after release of quick estimates before finalization: These three revisions are –

  (i) Data updation: Due to availability of data from more factories. This takes place one month from the release of Quick Estimates of IIP (this revision also takes place in compilation of fixed indices);

  (ii) Intermediate weight revision: This revision is due to availability of updated NAS figures from First Revised Estimates. This revision would be in the month of April of the subsequent year;

(iii) Final weight revision: This revision is due to updation of weights arising out of availability of ASI data for the year and release of Final Estimates of NAS. This revision will be after a year of the intermediate weight revision.

- Finalization occurs over a two-year horizon. This may lead to confusion among the users as the revisions would be taking place in indices and growth rates for two years at a time. This is because the intermediate weight revision of a year would take place along with the final weight revision for the previous year. This entails revision of indices and growth rates of two years at a time.
- The methodology detailed above closely aligns with international best practice but entails frequent revisions.

7 Issues for Stakeholder Consultation

Stakeholders are invited to provide views on the following:

i. Acceptability of chain-linking methodology: Which of the three techniques – (a) annual overlap technique, (b) one-quarter/ month overlap method and (c) over-the-year technique can best be used for developing Chain-based IIP in India

ii. Acceptability of increased revisions under a chain-based framework: As per the methodology discussed in the section 6 above, the indices would undergo 3 revisions after its release. These revisions would take place over a period two years. Stakeholder consultation is solicited on the acceptability of these long-term revisions

iii. Communication and dissemination strategy for preliminary, revised and final indices

8 Conclusion

The transition to a chain-based IIP represents a significant methodological improvement, but it also requires careful balancing of timeliness, accuracy, revision burden, and user confidence. Stakeholder feedback will be critical in determining the most appropriate path forward for India's IIP. Feedback received on the approach outlined in this discussion paper will be duly considered before finalizing the methodology for implementation.

The feedback/comments are invited on the proposed methodologies for Chain Linked Indices of IIP and may be sent at iipcso@nic.in by **25th January, 2026**.

Annex – 1

Trends in weights at Sectoral and Two-digit NIC level during 2011-12 to 2023-24

NIC 2 digit	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2022-23
10	5.30	5.47	5.59	5.44	5.69	6.40	6.40	6.52	6.62	6.98	5.85	5.96	5.88
11	1.04	1.19	1.13	1.12	1.20	1.07	1.12	1.12	1.19	1.05	0.86	1.17	1.15
12	0.80	1.06	0.99	1.11	1.27	1.05	0.98	0.99	1.05	0.94	0.73	0.81	0.80
13	3.29	4.78	4.58	4.26	4.12	4.08	4.10	4.12	4.21	3.78	4.05	3.43	3.39
14	1.32	1.58	1.91	1.75	2.07	1.93	2.02	2.02	2.32	1.73	1.78	2.07	2.04
15	0.50	0.53	0.67	0.65	0.72	0.71	0.70	0.71	0.77	0.62	0.60	0.64	0.63
16	0.19	0.22	0.23	0.26	0.28	0.28	0.25	0.25	0.30	0.24	0.26	0.25	0.25
17	0.87	0.88	1.13	1.06	1.06	1.03	1.25	1.25	1.45	1.26	1.23	1.44	1.42
18	0.68	0.78	0.56	0.83	0.81	0.70	0.72	0.73	0.69	0.43	0.40	0.53	0.52
19	11.77	10.41	8.95	10.73	10.80	10.84	9.15	9.18	2.77	3.53	5.28	7.25	7.16
20	7.87	7.36	7.29	6.82	8.98	8.38	8.29	8.31	9.42	9.84	9.15	8.19	8.09
21	4.98	5.06	5.65	5.81	6.07	6.00	5.88	5.89	6.95	7.64	7.08	6.12	6.04
22	2.42	2.56	3.37	3.24	3.29	3.38	3.09	3.10	3.85	3.97	3.60	3.55	3.51
23	4.09	4.42	3.97	4.21	3.73	4.22	4.41	4.42	4.69	4.51	3.98	3.69	3.64
24	12.80	8.46	11.02	8.99	6.29	6.84	8.37	8.40	8.56	11.44	14.04	9.65	9.53
25	2.65	3.02	2.71	2.59	2.63	2.55	2.52	2.53	2.63	2.30	2.22	2.60	2.57
26	1.57	1.74	1.92	1.69	1.91	1.98	1.86	1.87	1.83	1.95	1.87	2.19	2.16
27	3.00	3.33	3.14	2.89	3.24	3.19	3.08	3.09	3.09	2.88	2.67	3.33	3.29
28	4.77	5.47	4.29	4.73	4.79	4.80	5.32	5.34	5.20	5.27	4.64	5.26	5.20
29	4.86	5.84	4.93	6.16	6.85	6.47	5.99	6.00	6.12	5.61	5.57	6.73	6.65
30	1.78	2.05	1.98	2.03	2.05	2.05	2.25	2.25	2.97	2.38	2.05	2.19	2.16
31	0.13	0.24	0.21	0.24	0.22	0.20	0.23	0.23	0.30	0.28	0.27	0.30	0.29
32	0.94	1.15	1.15	1.44	1.17	1.36	1.37	1.37	1.53	1.41	1.57	1.58	1.56
Mining	**14.37**	**14.10**	**13.36**	**12.82**	**10.86**	**11.14**	**10.39**	**10.70**	**10.36**	**9.26**	**10.33**	**11.40**	**10.58**
Manufacturing	**77.63**	**77.60**	**77.39**	**78.04**	**79.25**	**79.53**	**79.35**	**79.67**	**78.53**	**80.05**	**79.75**	**78.92**	**77.95**
Electricity	**7.99**	**8.30**	**9.25**	**9.15**	**9.90**	**9.33**	**10.26**	**9.63**	**11.11**	**10.69**	**9.92**	**9.68**	**11.46**
General	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Annex – 2

Three techniques to combine quarterly/monthly indices with their annual weights:

Annual Overlap Technique – In the annual overlap method, the indices for a certain month (e.g. April 2023) are weighted with their (annual/ average) weights of the previous year and set in relation to the weighted annual average Indices of the previous year:

$$CL_{t,m} = \frac{\sum w_{i,t-1} \, X \, I_{i,t,m}}{\sum w_{i,t-1} \, X \, I_{i,t-1}}$$

The index for year *t* and month *m* is produced by multiplying the chain link (CL) with the corresponding quarterly index of the previous year:

$$I_{t,m} = CL_{t,m} \, X \, I_{t-1}$$

This technique is generally preferred as it ensures that monthly/quarterly indices aggregate exactly to the corresponding direct annual index.

One-quarter/ month overlap method – In the one-quarter overlap method, the indices for a certain quarter/ month are also weighted with their (annual/ average) weights of the previous year but are set in relation to the weighted last quarter/ month of the previous year. For obtaining an index this chain link is multiplied with the index for the last quarter/ month of the previous year:

$$CL_{t,m} = \frac{\sum w_{i,t-1} X \, I_{i,t,m}}{\sum w_{i,t-1} \, X \, I_{i,t-1,m12}}$$

$$I_{t,m} = CL_{t,m} \, X \, I_{t-1,m12}$$

Over-the-Year Technique – In the over-the-year method, the indices for a certain month are also weighted with their (annual/ average) weights of the previous year but are set in relation to the corresponding weighted month of the previous year. The index is calculated by multiplying this chain link with the corresponding month of the previous year:

$$CL_{t,m} = \frac{\sum w_{i,t-1} X \, I_{i,t,m}}{\sum w_{i,t-1} \, X \, I_{i,t-1,m}}$$

$$I_{t,m} = CL_{t,m} \, X \, I_{t-1,m}$$

A comparison of the formulas shows that the numerators of the three chain links are identical but the denominators are different: In the annual overlap method the annual averages of the indices of the previous year are used, in the one-quarter overlap method only the indices of the last quarter of the previous year are used, and in the over-the-year method the indices of the current month are set in relation to the indices corresponding month of the previous year.

In the annual overlap method and in the over the year method, each month is chained to the corresponding month of the previous year; in the one-quarter overlap method all indices are chained to the last quarter of the previous year.

General formula for Linking

$$L_t = \sum_i \left(w_{i,\,t-1} \frac{q_{i,t}}{q_{i,\,t-1}} \right) X \sum_i \left(w_{i,\,t-2} \frac{q_{i,t-1}}{q_{i,\,t-2}} \right) X \ldots\ldots X \sum_i \left(w_{i,\,0} \frac{q_{i,1}}{q_{i,\,0}} \right)$$

Where,

$w_{i,t-1}$= weight of item i at time $t-1$

$q_{i,t}$ = production of item i at time t

Annex – 3

Deflation of production captured in value terms

The deflation of production data received in value terms is done at the item group level itself before the calculation of relative production using the WPI of the items. The formula used for deflation is given below

$$P_{i,t}^{d} = P_{i,t}\, X\, \frac{WPI_{i,0}}{WPI_{i,t}}$$

Where,

$P_{i,t}^{d}$= Deflated production of item *i* at time *t*

$P_{i,t}$= Production of item *i* at time *t*

$WPI_{i,0}$= WPI of item *i* in the base year

$WPI_{i,t}$= WPI of item *i* at time *t*

The indices, thus calculated after the deflation exercise, are then linked together to produce a long-term series as detailed in Annex-2. Hence, no further deflation is required to be done in the chain-linking process.