



Centre for
Transportation and
Logistics

INDIAN INSTITUTE OF MANAGEMENT AHMEDABAD

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NEWSLETTER

October - December 2023

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Faculty Research

1. Capacitated multiple allocation hub location problems under the risk of interdiction: model formulations and solution approaches



Our CTL faculty member, **Prof. Sachin Jayaswal** published a research article with Prof. Vishal Bansal & Prof. Ankur Sinha titled "**Capacitated multiple allocation hub location problems under the risk of interdiction: model formulations and solution approaches**".

Abstract

Hub-and-spoke networks play a critical role in reducing cost and enhancing service levels in various infrastructural sectors since hubs act as the consolidation and transshipment points of the flows. The failure of hubs in such a network can cause severe disruptions. While disruptions can be natural or man-made, a disruption by a rational individual or entity can be significantly detrimental to the network and is often studied as an interdiction problem. It is important to take interdiction effects at the design stage; therefore, we study the three-level capacitated hub-and-spoke network design problem from the perspective of a defender who considers the risk of interdiction by a rational attacker. Within the three levels, the upper level represents the network design level, and the lower two levels represent the bi-level hub interdiction problem. The introduction of capacity constraints within an interdiction model dramatically increases the complexity of the problem, as there can be some unfulfilled flows post-interdiction. Moreover, a flow may or may not be fulfilled through the least-cost route using the nearest hubs. This work makes two major contributions: the first contribution is on the efficient handling of the bi-level hub interdiction problem using the Dual-based approach and the Penalty-based approach, and the second contribution is on solving the overall three-level problem using a super valid inequality. These two contributions allow us to solve large-scale versions of the capacitated multiple allocation p-median hub location problem under the risk of interdiction, which is otherwise mathematically intractable and can be handled only using complete enumeration techniques.

Read here: <https://doi.org/10.1007/s10479-023-05563-4>

[Home](#) > [Annals of Operations Research](#) > [Article](#)

Capacitated multiple allocation hub location problems under the risk of interdiction: model formulations and solution approaches

Original Research | [Published: 31 August 2023](#)

(2023) [Cite this article](#)

[Vishal Bansal](#) ✉, [Sachin Jayaswal](#) & [Ankur Sinha](#)

2. Zoning strategies for human–robot collaborative picking



Our CTL faculty and Co-Chairperson, **Prof. Debjit Roy** published a research paper with Dr. Kaveh Azadeh, Prof. René de Koster and Prof. Seyyed Mahdi Ghorashi Khalilabadi titled "**Zoning strategies for human–robot collaborative picking**".

Abstract

During the last decade, several retailers have started to combine traditional store deliveries with the fulfillment of online sales to consumers from omni-channel warehouses, which are increasingly being automated. A popular option is to use autonomous mobile robots (AMRs) in collaboration with human pickers. In this approach, the pickers' unproductive walking time can be reduced even further by zoning the storage system, where the pickers stay within their zone periphery and robots transport order totes between the zones. However, the robotic systems' optimal zoning strategy is unclear: few zones are particularly good for large store orders, while many zones are particularly good for small online orders. We study

the effect of no zoning (NZ) and progressive zoning strategies on throughput capacity for balanced zone configurations with both fixed and dynamic order profiles. We first develop queuing network models to estimate pick throughput capacity that correspond to a given number of AMRs and picking with a fixed number of zones. We demonstrate that the throughput capacity is dependent on the chosen zoning strategy. However, the magnitude of the gains achieved is influenced by the size of the orders being processed. We also show that using a dynamic switching strategy has little effect on throughput performance. In contrast, a fixed switching strategy benefiting from changes in the order profile has the potential to increase throughput performance by 17% compared to the NZ strategy, albeit at a higher robot cost.

Read here: <https://doi.org/10.1111/deci.12620>

DECISION SCIENCES



A JOURNAL OF THE DECISION SCIENCES INSTITUTE

ORIGINAL ARTICLE |  Open Access |   

Zoning strategies for human–robot collaborative picking

Kaveh Azadeh, Debjit Roy , René de Koster, Seyyed Mahdi Ghorashi Khalilabadi

First published: 20 December 2023 | <https://doi.org/10.1111/deci.12620>

3. Assessment of Marketing Channel Choice and its Impacts: The Case of Paddy Smallholders in India



CTL faculty **Prof. Poornima Varma** published a research paper with Dr. Sonalee Chauhan & Prof. Sukhpal Singh titled "**Assessment of Marketing Channel Choice and its Impacts: The Case of Paddy Smallholders in India**".

Abstract

Market access for smallholders is a key policy issue in developing economies. However, smallholders often face barriers in accessing remunerative marketing channels. Combining the theoretical framework drawn from resource-based view, social exchange, and transaction cost theory, we jointly estimate the determinants of marketing channel choice and the impact of channel choice in a joint framework. Results show that households' resource endowments and social capital influence channel selection decision. Paddy sales through

government agencies help farmers realize higher prices because of the higher government support prices and proximity to farms, whereas sales through licensed traders operating in the regulated markets (APMC) results in reduced paddy prices due to high transportation costs. Furthermore, smallholders preferring government agencies, processors, and licensed traders over village traders realize greater farm income. Reasons for such findings can be deduced to be the result of low marketable surplus for smallholders selling to village traders.

Read here: <https://doi.org/10.1080/08974438.2023.2291812>

Research Article

Assessment of Marketing Channel Choice and its Impacts: The Case of Paddy Smallholders in India

Sonalee Chauhan ✉, Poornima Varma & Sukhpal Singh
Published online: 22 Dec 2023

🗨 Cite this article 🔗 <https://doi.org/10.1080/08974438.2023.2291812> 🔍 Check for updates



[Full Article](#) [Figures & data](#) [References](#) [Citations](#) [Metrics](#) [Reprints & Permissions](#) [View PDF](#) [View EPUB](#)

CTL Events

1. Bollywood Beats Boredom: Addressing Drivers' Limited Attention with Movie- Themed Alerts

The Centre for Transportation and Logistics, IIMA hosted a research seminar on 'Bollywood Beats Boredom: Addressing Drivers' Limited Attention with Movie- Themed Alerts' by **Dr. Anuj Kumar**, Walter J. Matherly Professor of Information Systems, University of Florida – Warrington College of Business on Monday, November 20, 2023 at 3:00 pm IST.

The webinar was moderated by **Dr. Debjit Roy**, Professor, Operations and Decision Sciences, Indian Institute of Management Ahmedabad.





Centre for Transportation and Logistics

Research Webinar on

Bollywood Beats Boredom: Addressing Drivers' Limited Attention with Movie - Themed Alerts

November 20, 2023 | 3:00 - 4:00 p.m. IST

Moderator:
Dr. Debjit Roy
Institute Chair Professor and
Co-chairperson CTL

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 centre-for-transportation-and-logistics-iima

Dr. Anuj Kumar
Walter J. Matherly Professor
Warrington College of Business
University of Florida





Abstract

Behavioral economics and applied psychology identify the cognitive constraints in individuals due to finite attention and infinite information at any given point of time. Such limited attention may lead to suboptimal choices by individuals in varied areas like consumption, education, mobility or savings. Attention lapse happens in cases of repetitive work, leading to accidents and mishaps. Reminders are a way of overcoming limited attention and bring desired activity to the top of the mind. However, individuals may not pay attention to reminders due to boredom. Literature reveals that exposure to the same media signals can cause boredom and negate the entire purpose of these reminders.



The study explored the impact of varied Bollywood themed audio alerts for truck drivers in collaboration with a truck driver safety app in India. An alert was sent to drivers every 15 minutes. The field study was carried out on 18,510 truck drivers who made 707,338 trips, divided into a control group and treatment group where the treatment group received Bollywood themed alerts. The study revealed an increase of 104% in distance per trip and 76% increase in duration per trip for treatment group drivers. The study found that new alerts have a significantly higher effect on app engagement than monetary rewards. The findings reveal that drivers react more negatively to old alerts after experiencing new alerts. Interestingly, no evidence of attenuation of the effect of new alerts was found with the passage of time. The study reveals that novel delivery mechanisms for reminders can counter drivers' boredom. The advent of new technologies like GenAI can further enhance efficiency of these initiatives through personalized and context specific variations in repetitive alerts.

To watch the webinar, visit: <https://youtu.be/IHNFZQiWc2g?feature=shared>

2. Grant Proposal Writing

The Centre for Transportation and Logistics, IIMA organised a session on 'Grant Proposal Writing' by **Dr. Subhrajit "Subhro" Guhathakurta**, Professor, Georgia Tech School of City & Regional Planning on Saturday, December 16, 2023.

The session was moderated by **Dr. Sandip Chakrabarti**, Co-chairperson, Centre for Transportation and Logistics Indian Institute of Management Ahmedabad and it was attended by the doctoral students of IIMA.



Centre for Transportation and Logistics
Indian Institute of Management Ahmedabad

Session on Grant Proposal Writing

WITH

Prof. Subhrajit Guhathakurta
Georgia Institute of Technology

DECEMBER 16, 2023

11:30 AM - 01:00 PM

Description

Prof. Guhathakurta provided valuable insights from his rich experience of receiving several grants from prominent funding agencies of the US. Following are the key takeaways from the session:

1. It is important to understand and align one's research interests and goals with that of the funding agency. Reviewers in funding agencies use multiple factors while making a decision about accepting or rejecting a grant request.
2. Prof. Guhathakurta emphasized on the need to explore hard problems for research and create innovative solutions for the same. A thorough review of the literature is essential to attain clarity about how the problem has been dealt with.
3. While applying for a grant, it is important for the applicant to highlight the element of novelty in their approach and its potential in generating better results.
4. Articulation of the idea within limited words is the key for a successful application. It is better to receive feedback from a diverse pool of peers to ensure the message is conveyed in a persuasive manner and revisions can be made, wherever necessary.



5. Justification of funds is another crucial component of proposal writing.
6. Proposal writing varies according to the type of research and an applicant should read successful proposals to get a flavor of what makes a proposal engaging and persuasive.
7. In cases of unsolicited proposal submission, the main focus should be understanding of pain points and issues that the funding agency cares about, and conveying the benefit of funding research to tackle those problems.

One must note that there is always an element of uncertainty in securing a grant and there is no predetermined approach for a favorable decision.



CTL Faculty Engagements

1. A cutting-plane based approach for fixed-charge transportation problems

Prof. Sachin Jayaswal, CTL Faculty member delivered a Research Seminar on “**A cutting-plane based approach for fixed-charge transportation problems**” at IIM Bangalore on October 17, 2023.



2. Confederation of Indian Industry and The Infravision Foundation Conference



CTL Co-Chairperson **Prof. Sandip Chakrabarti** discussed innovative and practical strategies for improving the financial sustainability of metro rail systems across India in a conference jointly organized by Confederation of Indian Industry and The Infravision Foundation in New Delhi on December 4, 2023.

The conference theme was “Urban Mobility: Towards Seamless Integration”. Prof. Chakrabarti also joined a panel discussion on “Investing in Future Ready Systems” moderated by urban expert Mr. Jagan Shah, along with industry leaders from Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, L&T Metro Rail

(Hyderabad) Ltd., India Infrastructure Finance Company Limited (IIFCL) and The World Bank. The discussions generated constructive policy and planning ideas for developing effective transit and shared mobility systems in India, and also for boosting PPPs in the urban public transportation sector. CTL continues to contribute to urban transportation policy discussions in India by offering useful insights based on impactful research.



3. 2023 Transportation Science Meritorious Service Awards



CTL Co-Chairperson **Prof. Debjit Roy** received the prestigious 2023 Transportation Science Meritorious Service Award. The award recognizes associate editors, special issue guest editors, and reviewers who have offered exceptional service in the review process.

Visit: <https://pubsonline.informs.org/doi/10.1287/trsc.2023.servawards.V57.n6>



<https://pubsonline.informs.org/journal/trsc>

TRANSPORTATION SCIENCE

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2023 Transportation Science Meritorious Service Awards

4. Stochastic Models for Integrated Warehousing Systems: Modeling Constructs and Research Opportunities in Order Fulfillment



Prof. Debjit Roy, CTL Co-Chairperson visited IIM Ranchi on December 7, 2023 to deliver a lecture on "Stochastic Models for Integrated Warehousing Systems: Modeling Constructs and Research Opportunities in Order Fulfillment".

5. IIMA R&P presentation



Professor **Subhrajit "Subhro" Guhathakurta**, Georgia Institute of Technology and member of CTL Research Advisory Committee presented his research on spatial equity and equality implications of on-demand multimodal transit service, using data from Atlanta, as part of Research and Publications at IIM Ahmedabad's Seminar Series. Technology facilitated on-demand transportation services are relevant for India's cities as well. With appropriate designs and policies, such systems have the potential to promote sustainable development and equitable access. Urban analytics offers great opportunities for exploring innovative solutions to a wide range of mobility challenges.

6. 7th Conference of the Transportation Research Group of India



Centre for Transportation and Logistics, IIMA was a supporting knowledge partner of the 7th Conference of the Transportation Research Group of India, along with Indian Institute of Technology, Bombay, Gati Shakti Vishwavidyalaya, Technical University of Munich, and other prominent Indian and international institutions. The conference, held in Surat, Gujarat this year, featured cutting edge research in passenger and freight transportation from researchers around the world.

CTL Co-Chairperson **Prof. Sandip Chakrabarti** was an Organizing Committee and Scientific Committee member of the conference, chaired the Technical Track on Mobility Networks, and was the Session Chair of the Freight and Mobility session at the conference.

IIMA CTL was represented prominently at the conference. CTL Research Advisory Committee members **Prof. Chandra Bhat** of The University of Texas at Austin and **Prof. Geetam Tiwari** of Indian Institute of Technology, Delhi delivered keynote addresses.



7. Empowered Committee for Industry and International Collaboration, Ministry of Education, Government of India



The Ministry of Education, Government of India has created a special task force named "Empowered Committee for Industry and International Collaboration" along 12 verticals of "Critical and Emerging Technologies." One of the verticals is "Smart Cities and Mobility," and the vertical comprises an expert sub-committee composed of top researchers in the field drawn from premier Indian institutes. **CTL Co-Chair Prof. Sandip Chakrabarti** has been selected to serve on this sub-committee. The members of the sub-committee are Prof. Geetam Tiwari (IIT Delhi), Prof. Sandip Chakrabarti (IIMA), Prof. Arnab Jana (IIT Bombay), and Prof. P Rajalakshmi (IIT Hyderabad). Their mandate is to develop a report to identify future research agendas and strategies in India under the smart cities and mobility theme.

Thought Leadership

1. Opinion: India has better options than banning rice exports

Opinion article titled 'India has better options than banning rice exports' featured in Nikkei Asia on August 17, 2023. The article was written by **Prof. Poornima Varma**, CTL faculty member.



Read here: <https://asia.nikkei.com/Opinion/India-has-better-options-than-banning-rice-exports>

2. Opinion: India's metro rail systems should become financially sustainable

Opinion article titled 'India's metro rail systems should become financially sustainable' featured in Mint on October 04, 2023. The article was written by **Dr. Sandip Chakrabarti**, Co-Chairperson CTL along with Mr. Nitin Zamre, CEO, The Infravision Foundation.

mint Premium | OPINION

India's metro rail systems should become financially sustainable

Nitin Zamre, Sandip Chakrabarti | 3 min read | 04 Oct 2023, 08:28 PM IST



Indian metro rail systems suffer from a lack of periodic fare updates, leading to gradual erosion of the real value of fares, plummeting real revenues, increasing subsidy requirements and sudden large fare hikes after long gaps.

Read here: <https://www.livemint.com/opinion/online-views/indias-metro-rail-systems-should-become-financially-sustainable-11696429843913.html>

3. Opinion: Land Value Capture: A self-financing and sustainable model for infrastructure development

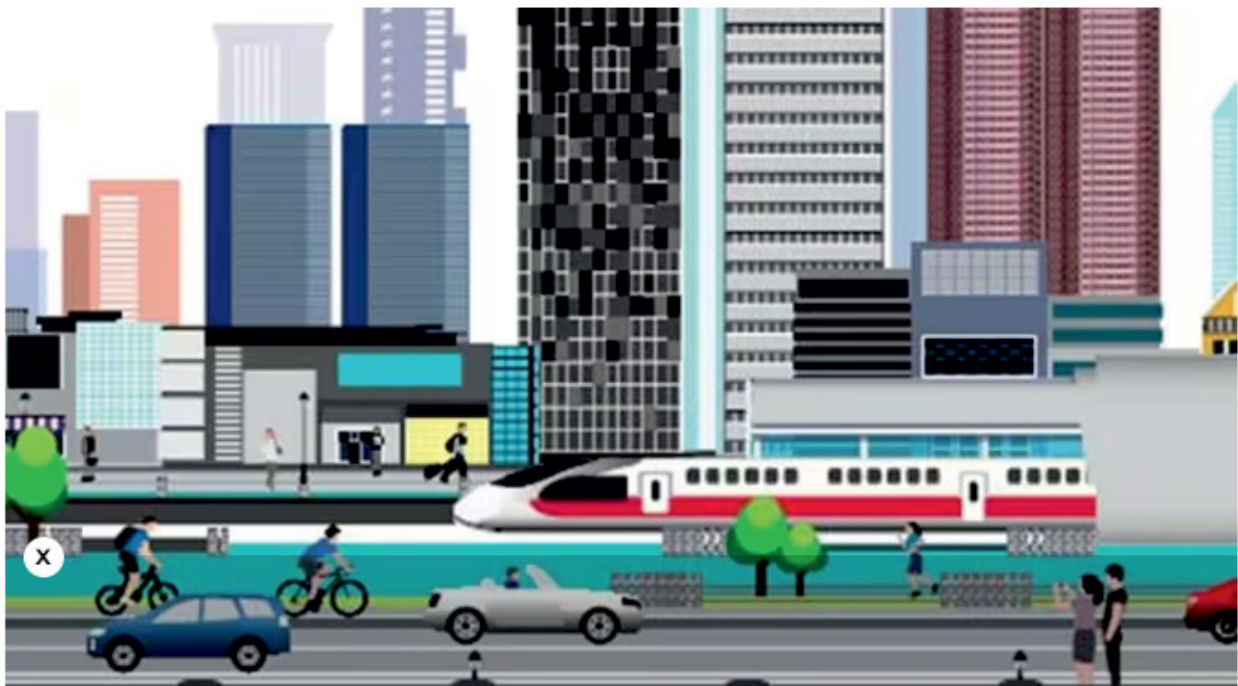
Opinion article titled 'A self-financing and sustainable model for infrastructure development' featured in Financial Express on November 27, 2023. The article was written by **Dr Prashant Das**, Associate Professor, IIMA and CTL Faculty Member along with IIMA PGPX participants Mr Yash Choudhary and Ms Anchal Agarwal.

Land Value Capture: A self-financing and sustainable model for infrastructure development

LVC can be an effective funnel to fill the funding gap in India's infrastructure needs.

Written by Guest

November 27, 2023 10:38 IST



LVC cannot be a one-size-fits-all scheme. It must be molded into the structural demands of local infrastructure.

Read here: <https://www.financialexpress.com/money/land-value-capture-a-self-financing-and-sustainable-model-for-infrastructure->

CTL Snippet



CTL Snippets E5: Boosting productivity of Indian artisanal supply chains



Dr. Somya Singhvi

Assistant Professor
Data Sciences and Operations Department
USC Marshall School of Business

IIMA

Prof. Singhvi discussed his work related to artisanal supply chain in India based on field work with a rug manufacturer from Rajasthan. Displaying the setting of a disaggregated resource constrained supply chain, Indian artisanal (weaving) supply chain predominantly employs women who work from their home due to social constraints. The raw materials are provided by the rug trader and frequent supervisory visits by a designated supervisor help ensure the work is done according to the standard quality parameters. Geographical isolation, infrequent supervision and labour intensive nature involving intricacies of design lead to productivity inefficiency. Their study showed 3-14% decrease in weaving time and 15-17% improvement in weaver's income due to additional supervisory visits. Further, frequency of supervisor visits helps in picking out mistakes in design early and reduces duplication of efforts.

To watch, visit: <https://www.youtube.com/watch?v=JibcbCtJYIA>

News Watch

1. Completion of Eastern Dedicated Freight Corridor

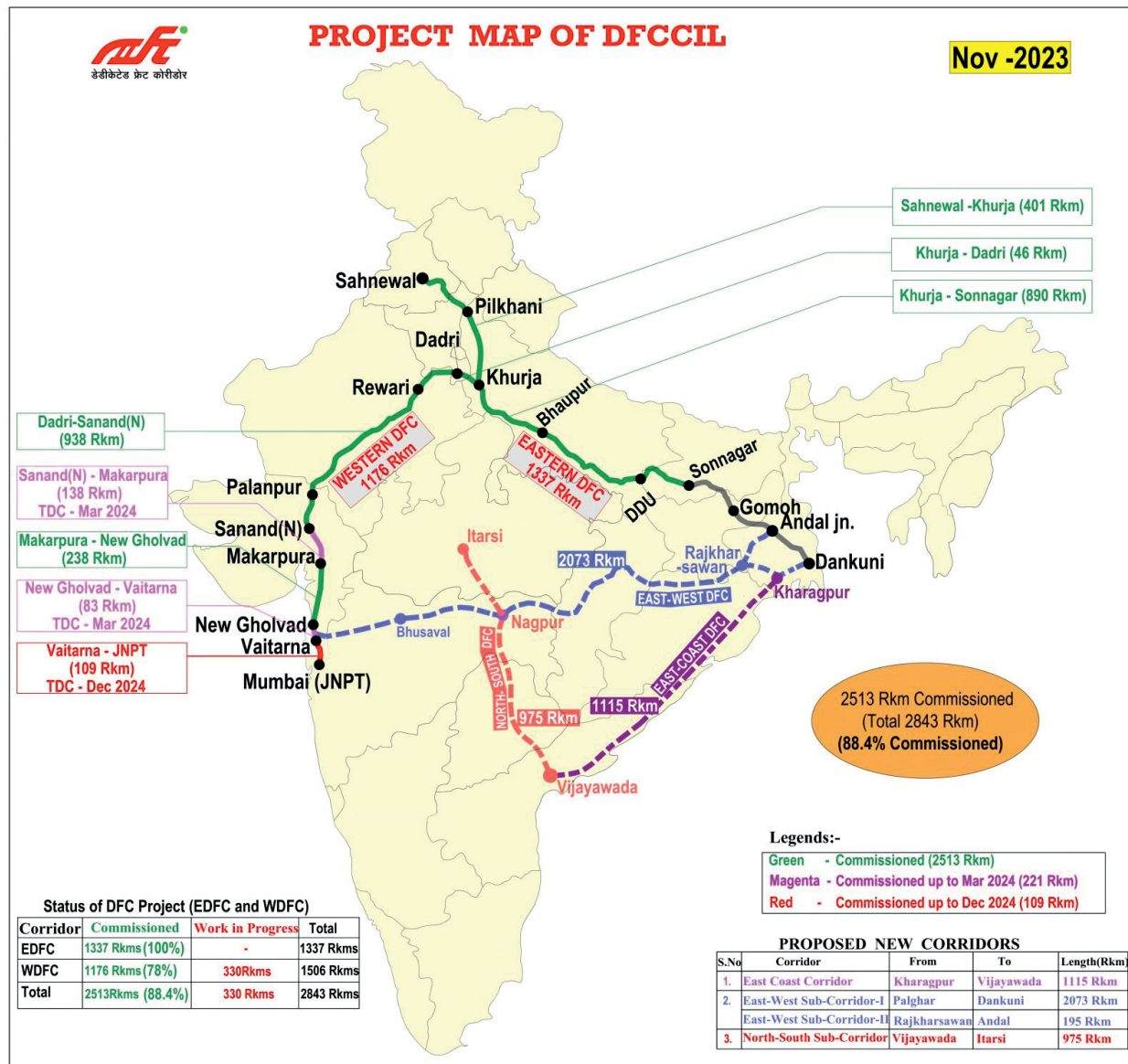


Image courtesy ~ DFCCIL

The Dedicated Freight Corridor Corporation of India Limited (DFCCIL) announced the completion of Eastern DFC and fully operationalized the 1337 km freight corridor for full service on November 1, 2023. The freight corridor passes through four Indian states with terminal stations at Ludhiana (Punjab) and Sonnagar (Bihar). The Railways has further proposed an extension of EDFC from Sonnagar to Dankuni (West Bengal) through a PPP model.

Find out more at (click here)

<https://www.linkedin.com/feed/update/urn:li:activity:7143563260284272640>



The write-up was prepared by

Mr. Shubham Siwach

Research Associate, CTL IIMA



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