MEMORANDUM OF UNDERSTANDING

BETWEEN

THE NATIONAL SMALL INDUSTRIES CORPORATION LTD.

(A GOVERNMENT OF INDIA ENTERPRISE)

TECHNICAL SERVICES CENTRE

JAPANIGATE, BALTIKURI, HOWRAH-711113, WEST BENGAL.

(here-in-after to be called 'THE FIRST PARTY')

AND

ALIAH UNIVERSITY

II A/27 NEW TOWN, KOLKATA-700160, WEST BENGAL

(here-in-after to be called 'THE SECOND PARTY')

Technical Services Centre
एन एस आई सी
NSIC
ISO 9001 : 2015
Howrah

About NSIC:

NSIC-Technical Services Centre, Howrah (NSIC-TSC, Howrah) is one of the Technical Services Center of National Small Industries Corporation (NSIC), a Government of India Enterprise under the Ministry of MSME, having its registered office at NSIC Bhawan, Okhla Industrial Estate, New Delhi-110020. All Technical Service Centre are engaged in imparting industry centric, demand oriented training for skill / entrepreneurship development to address the demand of skilled manpower in the industry. We also offer services to the industries through our NABL accredited Laboratory.

About the Institute:

ALIAH UNIVERSITY, approved by UGC, AICTE, INC/WBNC & NCTE offers Degree courses on Engineering, Management, Natural Sciences, Humanities, Social Sciences, Languages, Law, Journalism and Mass Communication, Religious Studies (Islamic Theology) and Bachelor of Education.

1. **NSIC-TSC**, Howrah will act as Skill Knowledge Provider (SKP). NSIC-TSC, Howrah and **ALIAH UNIVERSITY** shall finalize jointly the details of training/internship program(s) including their curriculum and training delivery plan for each of the training/internship program(s) with an objective to impart training to the students engaged with **ALIAH UNIVERSITY**. The training/internship to the students of **ALIAH UNIVERSITY** shall be imparted in the campus of NSIC-TSC.

2. **ALIAH UNIVERSITY** shall inform their students that the training/internship programs conducted by **NSIC-TSC**, Howrah are non-residential and fee once submitted shall not be refunded/ adjusted due to any reason.

3. **NSIC-TSC**, Howrah shall ensure the resources to be in place prior to the schedule of training/internship for imparting training/internship on the specific training/internship courses selected by students of **ALIAH UNIVERSITY**.

4. **NSIC-TSC**, Howrah shall share the training plan (day to day lesson plan) to the students of **ALIAH UNIVERSITY** on the first day of their joining the training course.

5. **NSIC-TSC**, Howrah shall carry out the assessment of students and issue certificate to trainees.

6. **NSIC-TSC**, Howrah shall allow officials from Aliah University to visit the area where the training courses for the students of **ALIAH UNIVERSITY** will be conducted.

7. **NSIC-TSC**, Howrah shall be responsible to monitor the trainees during their presence in its premise. **ALIAH UNIVERSITY** shall be responsible to maintain discipline of their students in NSIC-TSC, Howrah campus. In case of any indiscipline/continued absenteeism, the same shall be reported to **ALIAH UNIVERSITY** for their onward action.

8. Training Fees shall be decided as per training program / curriculum on mutual discussion. **ALIAH UNIVERSITY** shall submit the list of students along with training course, topics to be covered in individual training program & schedule of training program. Training fees including applicable taxes will be paid by **individual students directly to** NSIC-TSC, Howrah.

9. Each Party will appoint a coordinating officer within their respective organizations, who will be responsible for follow up and coordination of the matter.

10. No party shall have the right to use the name or logo of another party without the prior approval of that party in writing.

11. Neither party shall be made responsible for an unexpected or uncontrollable event.

The arrangement shall be effective from the date of signing and it shall remain in effect for a period of One year. Thereafter it may be continued by mutual written consent.

For and on behalf of
The FIRST PARTY

3.3.21

Mr Subodh Jaiswal
General Manager(SG)
NSIC- Howrah

Technical Services Centre
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Howrah

For and on behalf of
The SECOND PARTY

9/3/21

Dr.Syed Nurus Salam
Registrar
ALIAH UNIVERSITY

Registrar
Aliah University

ALIAH UNIVERSITY
ESTD-2008
New Town, Kol-156

Witnesses:

1.

2. Md. Jahir Hossain

PARTNERSHIP MoU

This **Memorandum of Understanding** (hereinafter called as the 'MOU') is entered into between

KRACKiN a unit of iNURTURE Education Solutions Pvt. Ltd, a company registered under the Laws of India, havingitsregisteredofficeat#11/4NitonCompound,BlockB-1,Palace Road, Bangalore - 560052 (hereinafter referred to as "First Party"

AND

Aliah University having its main campus at **II-A/27, Newtown, Kolkata, West Bengal-700160**,

(First Party and Second Party are hereinafter jointly referred to as 'Parties' and individually as

'Party')

WHEREAS:

KRACKiN a unit of iNURTURE Education Solutions Pvt.Ltd. strives to strengthen the quality of education in educational institutions and enhance the industry readiness of its students through its offering in KRACKiN platform.

Skill-X is a Skilling solution offered by KRACKiN :

- Software solution to help educational institutions improve the industry readiness of its students
- Online skilling platform providing students with a ready repository of skilling interventions and knowledge resources to build the skills required by the industry
- Showcase the profile to Industries for career opportunities

Aliah University started its glorious journey from the 2008-09 academic sessions with great potential and immense opportunities. It is hoped that this university, harmonizing tradition and modernity, will emerge as a unique institution of higher studies and research. As per Aliah University Act 2007, Section 3 (3), it has been conferred the status of a minority educational institution. Aliah University is an autonomous university under the Department of Minority Affairs and Madrasah Education, Government of West Bengal. It is hoped that along with the people of any race, creed, caste or class, this University will play a crucial and leading role in the advancement of higher education for socially and educationally backward classes belonging to the Minorities.

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Second Party & First Party believe that collaboration and co-operation between themselves will promote more effective use of each of their resources, and provide each of them with enhanced opportunities.

Both Parties, being legal entities in themselves desire to sign this MOU for advancing their mutual interests. AND WHEREAS, both the parties have expressed a common interest in providing industry relevant training to the engineers, enhance their awareness, expand their industry connect and in the process, increase their employability.

NOW THEREFORE, IN CONSIDERATION OF THE MUTUAL PROMISES SET FORTH IN THIS MOU, THE PARTIES HERETO AGREE AS FOLLOWS:

CO-OPERATION

Both Parties are united by common interests and objectives, and they shall establish channels of communication and co-operation that will promote and advance their respective operations. The Parties shall keep each other informed of potential opportunities and shall share all information that may be relevant to secure additional opportunities for one another.

SCOPE OF THE MoU

KRACKiN shall provide access to the Skill-X platform to all the students of the institution, through which the students can build their profile, understand their employability score and explore the various skill-building resources available in the platform.
The student can decide to avail certain services of interest to him/her at the appropriate cost.

ROLES AND RESPONSIBILITIES

Role of KRACKiN

1. The Students shall be on-boarded to the SkillX platform and the students shall be notified about the login credentials through e-mails
2. KRACKiN shall engage with the students through different means to educate them about the latest skills required in the industry and how the students can improve their employability
3. Assign a SPOC for interacting with the management of the institution

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Role of Institution

1. Onboard the students of the institution on to the platform.
2. Provide an SPOC for day to day communication.
3. Actively promote online course amongst students to take up programs as a part of Skill Enhancement Program.
4. Allow KRACKiNTeam to connect with the students to help enhance their employability quotient and guide them on their industry readiness.

Skill-X FUNCTIONALITY

- **Digital Profile**

Students can create their digital profile based on industry-relevant parameters. Its employability algorithm computes the score for their profile based on the data provided. The holistic profile helps a student to create an all-encompassing archive of academic accomplishments, projects and scores.

- **Industry Readiness Meter (Personal Career Assistant)**

It is a platform that acts as a job-readiness tracking system. It helps analyzing gaps and recommends suggested learning paths. These skilling paths have been created in consultation with the industry and respective domain experts.

Skill Centre

It is a repository of online skilling courses recommended by the industry partners. It provides an overview of industry trends and helps identify the skill sets required to be industry-ready.

Recruitment Engine

Helps students find internship and recruitment opportunities. The platform will help students to showcase their holistic profile to the suitable recruiters through the platform. Companies will select candidates based on the profile / employability scores. For showcasing the profile to the potential employers, students can choose to avail feature.

INTELLECTUAL PROPERTY

Nothing contained in this MOU shall, by express grant, implication, Estoppel or otherwise, create in either Party any right, title, interest, or license in or to the intellectual property (including but not limited to know-how, inventions, patents, copy rights and designs) of the other Party.

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DATA PRIVACY

KRACKiN shall use the Information only for the Purpose above said and not disclose any or part or summary or extract of the Information to any third party without student's prior consent.

VALIDITY

This Agreement will be valid for a period of 3 years from the date of signing of this MoU and can be extended by mutual consent.

Both Parties may terminate this MOU upon 60 calendar days' notice in writing.

IN WITNESS WHERE OF THE UNDERSIGNED, duly authorized thereto, have signed thisMemorandum of Understanding.

For and on behalf of **KRACKiN**a unit of **iNurture Education Solutions Pvt. Ltd**	For and on behalf Of **Aliah University**
Signaturewith Seal: KRACKIN TECHNOLOGIES PVT. LTD.	Signature with Seal: Registrar (Acting) Aliah University IIA/27, New Town, Kol-156
Date:	Date 20/02/2020
Name & Address:	Name & Address: Prof. Amzed Hussain Aliah University, IIA/27, New Town - 701 - 160
Witness 1	Witness 2
Signature:	Signature:
Date: Ravi A. Purohit	Date: 20/02/2020
Name & Address:	Name & Address: Md. Jauir Hossain Molla. Aliah University, IIA/27, New Town 701-160.

Annexure – 1

Scenario 1: Student opting for the employment platform

Annual Subscription for Value Added Services

Sl. No	Particulars	Price
1	Annual Subscription for Value Added Services	Rs. 599/-

*Prices are subject to Change
**GST will be applicable on the above prices.

5 Key Benefits to ALIAH University Students:

1. Digital Profile

2. Industry Readiness Meter (Personalized Skilling Assistant)
   - Exploring New Age Jobs
   - Check Industry Readiness for various Job Roles
   - Analyzing Gaps – Skills, Certifications, Projects etc
   - AI based Upskilling Recommendation

3. Upskilling
   - Learning path recommendation
   - Complimentary Courses
   - Tracking and Monitoring the Learning Progress
   - One Aptitude Assessment
   - One Technical Skill Assessment

4. Awareness about the new job roles in the Industry

5. Recruitment Engine
   - Profile Showcasing to Recruiters
   - Applying to Jobs as per the Industry
   - Getting Noticed by large pool recruiters
   - Identifyingbest fit Jobs

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Scenario 2 : In this case the student have already understood the **Skill Gap** with regard to particular job role, and now wish to enroll for **INDUSTRY ENDORSED COURSES** through the platform.

1. Online Skilling Courses

It is a repository of online skilling courses recommended / endorsed by the industry partners. It provides an overview of industry trends and helps identify the skill sets required to be industry-ready. Access to wide range of online / blended programs for the students for up skilling and making industry ready.

- Wide range of Course across domains
- Cross domain selection of courses

2. Online Skilling Courses – Career Tracks

KRACKiN Skill-X Career Tracks are a collection of courses offered by top industry partners to enable you achieve your career goals. You can deep dive into a specific career track and can be assured that the learning will enhance your potential and is very relevant to current job opportunities. Student can start a foundation course and subsequently move to advance courses that will not only enhance knowledge and skills, but will help to achieve the career goals. Student can opt for any career track which comprises of 3-4 skill courses in each Career Track.

Pricing and Commercials:

Sl. No	Particulars	Price
1	Online Courses – Skill Courses (Per Student Per Course)	Rs.1800/-* to Rs.2800/-*
2	Online Courses – Career Track (Per Student 3-4 Online Courses)	Rs.6500/-* to Rs.11500/-*

*Prices are subject to Change
**GST will be applicable on the above prices.

Fees for the above services / programs will be collected directly from the students.

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Memorandum of Understanding

This Memorandum of Understanding is entered on 03/11/2021 ("Effective Date") by and between **Edunet Foundation** having its office at A-11- 1105, Arcadia South City 2, Gurgaon 122018, India (hereinafter referred to as "**Edunet**"); and,

Aliah University , an autonomous University having its address IIA /27, New Town, Kolkata -700160, West Bengal (hereinafter referred to as "Institution").

Whereas, Edunet is a non-profit organization with multiple programs, sponsored by government and corporate entities, that are offered free to learners across the education spectrum, including but not limited to the Tech Saksham Program (www.techsaksham.org) and SkillsBuild (www.skillsbuild.org).

Whereas, Institution is a premier institution with the following details:

Established (year):	2008-09
Recognition, NAAC rating, ranking:	UGC, AICTE, INC, WBNC, NCTE
Vision:	To become a Centre of Excellence and to contribute to the society through the pursuit of teaching and research in the emerging areas in each branch of modern science, engineering and technology, social studies, and humanities with a deep passion for wisdom, culture and values

And whereas, the Parties seek to collaborate with each other to mutually complement their synergies and to jointly work on building capacity of learners through one or more of the programs managed by Edunet.

Now therefore, this **Memorandum of Understanding** (hereinafter called "**MOU**")witnesses the following.

1. **Term and termination**: This MOU is valid for an initial term of 5 years from the Effective Date. It can be extended by further periods, as agreed to by the Parties from time to time. Either Party may terminate this MOU by giving the other minimum 30 days' notice. The MOU will be deemed terminated at the end of the notice period or after completing all ongoing activities so that the beneficiaries (learners and teachers) are not negatively impacted, whichever is later.

2. **Non-binding nature of this MOU**: The MOU is not binding on either Party and each is working with the other out of sheer good-will and for the benefit of the learners.

3. **Each Party is responsible for its own costs:** Both the Institution and Edunet will independently manage their cost towards fulfilment of obligations under this MOU.

4. **Single Point of Contact (SPOC) for program co-ordination**: Both the Parties shall appoint a suitable person who will serve as a single of contact on all matters related to program rollout. Individual learners and teachers may be in touch with corresponding trainers, mentors, advisors and peers during program rollout but all matters related to the execution of this MOU shall reside with the SPOC.

5. **Society for Inclusive Education (SIE):** This is a student led initiative managed and supported by Edunet,

ALIAH UNIVERSITY ESTD-2008 IIA/27, New Town, Kol-156

that seeks to provide ubiquitous high quality learning opportunities to underserved communities through government and private schools/colleges around India. The Institute will set up a chapter of Society for Inclusive Education on its campus. This chapter will make Edunet programs available to local underserved institutions and/or student communities through community work, classroom sessions, fund raisers to purchase equipment and free learning platforms. Office bearers will be chosen by the Institute in the first year. They may be either nominated or elected second years. The SIE chapter will have members from within the local student community who are willing contribute some time towards betterment of society. All members of SIE chapter at the Institution will be issued with appropriate certification that will help them meet their CAS/Community Work/SUPW requirements.

6. **Program Calendar**: The SPOCs from both Parties will work with their respective internal stakeholders to develop a calendar for the program(s) rollout at the start of every quarter. This calendar will then by synchronized and published for use by everyone.

7. **Responsibilities of Edunet and/or its program sponsors/partners**:
   a. **Orientation sessions**: Edunet will conduct orientation sessions for learners and educators, at a mutually agreed schedule, to onboard them onto the program(s).
   b. **Program materials**: Edunet will share all program materials with the institution and/or learners as required. All sharing will be online and/or through electronic media.
   c. **Face to face, instructor led sessions**: For learners in the Tech Saksham Program, face to face ILT sessions will be organized on campus and will be delivered by Edunet Trainers to program beneficiaries
   d. **Online instructor led sessions**: These sessions may take the form of webinars or mentoring workshops or technology bootcamps or innovation camps or career readiness workshops that will seek to assist learners in their career goals. These programs will be organized regular as per a regular calendar, published online and will be conducted by Edunet team members or program sponsors or external stakeholders as appropriate.
   e. **Interaction with Industry experts:** Edunet will bring industry experts to the Institute to drive engagements with students through seminars/webinars or project mentorship.
   f. **Online platform availability**: Online platforms for each of the programs of interest to the Institution will be made available to it. Links for these platforms will be made available to the Institution in a timely manner
   g. **Assessments**: Edunet will conduct assessments, as required, for its programs prior to certification by Edunet and/or its industry partners and/or participating government agencies.
   h. **For programs with career paths**: Edunet will provide linkages with local and regional industry, government and the local start-up ecosystem (incubators etc) that will help learners with gainful employment and/or entrepreneurial opportunities. Interactions will be encouraged in terms of classrooms sessions, workshops, internship opportunities, career opportunities and entrepreneurship opportunities.
   i. **SIE support**: Edunet will support the SIE chapter in the Institute with all support required. A separate program manual and guidelines will be sent to the SPOC.
   j. **Updates:** Edunet will keep Institution management updated with the progress of the program(s)

8. Responsibilities of Institution:
   a. **Learner identification**: Institute will identify learners, volunteers and instructors who may participate in one or more programs offered by Edunet.
   b. **Support with orientation sessions**: Institute will support Edunet conduct orientation sessions for all stakeholders.
   c. **Publication of program calendars and goals**: Institute will publish, on a quarterly basis, a program calendar for all its participants.
   d. **Support with computers labs and classrooms**: Institute will make its labs available to learners. It will make classrooms and/or audio-visual equipment available for face to face sessions,

ALIAH UNIVERSITY ESTD-2008 New Town, Kol

whenever required.

e. **Support with attendance**: Institute will ensure that program participants enthusiastically participate in chosen programs, with minimum attendance as agreed between the Parties.

f. **Support with assessments**: Institute will ensure that assessments carried onsite are proctored and professionally managed.

g. **SIE chapter**: The Institute will support the SIE chapter, led by its students, to the extent possible.

h. **No fees**: As it's a CSR activity of Skillsbuild, Edunet will not charge any fees from the learners or the institution, and neither will the institute charge any fees from the learner.

IN WITNESS WHEREOF, the parties hereto have executed this MOU on the Effective Date.

For Institution

Name: Dr. Syed Nurus Salam
Designation: Registrar
Institutional Seal:

For Edunet Foundation

Name: NEERAJ BAGGA
Designation: TRUSTEE

पश्चिमबङ्ग पश्चिम बंगाल WEST BENGAL SBAB 653126

MEMORANDUM OF UNDERSTANDING (MoU)

BETWEEN

ALIAH UNIVERSITY
Action Area II, Plot No.- IIA/27, Newtown, Kolkata, 700160, West Bengal

&

Ardent Computech Private Limited, Module No -132,

SDF Building, Sector -V, Kolkata -700091, West Bengal

Indranil De Sarkar

ARDENT COMPUTECH PVT. LTD. KOLKATA

নং - ৭৫০৮
সন ও তারিখ - 28.7.21
ক্রেতার নাম - [illegible]
সাকিন - (k-9)
স্ট্যাম্প মূল্য -
ভেন্ডার -

বারাসাত কোর্ট, উত্তর ২৪ পরগণা
ভেন্ডার - শ্রী হারান চন্দ্র সাধু
টি.ভি. নং - 8 SEP 2021
তারিখ - 300000
মোট স্ট্যাম্প মূল্য -
ট্রেজারী অফিস - বারাসাত

This Memorandum of Understanding (hereinafter called as the 'MoU') is entered into on this the 23rd day of Dec 2021by and between.

Aliah University, KolkataAction Area II, Plot No.- IIA/27, Newtown, Kolkata, West Bengal 700160 the First Party and represented herein by Dr. Syed Nurus Salam (Registrar) (hereinafter referred as **'First Party'**, the institution which expression, unless excluded by or repugnant to the subject or context shall include its successors – in-office, administrators and assigns).

AND

Ardent Computech Private Limited, Module No -132, SDF Building, Sector -V , Kolkata -91thesecond party, and represented herein by its Director Mr. Indranil De Sarkar. (hereinafter referred as **'Second Party'**, the institution which expression, unless excluded by or repugnant to the subject or context shall include its successors – in-office, administrators and assigns).

WHEREAS:

A) First Party is a Higher Educational Institution named: Aliah University.

B) First Party & Second Party believe that collaboration and co-operation between themselves will promote more effective use of each of their resources, and provide each of them with enhanced opportunities.

C) The Parties intent to cooperate and focus their efforts on cooperation within area of Skill Based Training, Education, Placement, Industrial Visit, Expert Lecture.

D) **Ardent Computech Private Limited** (CIN- U72300WB2010PTC142869) the Second Party is engaged in Technical Training & Software Development.

Indranil De Sarkar

ARDENT COMPUTECH PVT. LTD. KOLKATA

NOW THEREFORE, IN CONSIDERATION OF THE MUTUAL PROMISES SET FORTH IN THIS MOU, THE PARTIES HERETO AGREE AS FOLLOWS:

CLAUSE 1 **CO-OPERATION**

1.1 Both Parties are united by common interests and objectives, and they shall establish co-operation.

1.2 First Party and Second Party co-operation will facilitate effective utilization of the intellectual capabilities.

1.3 The parties shall co-operate with each other and shall as promptly as is responsibly practical. relevant agreement.

CLAUSE 2 **SCOPE OF THE MOU**

2.1 Industrial Training & Visits: Industry and Institution interaction will provide an insight into the latest developments / requirements of the industries; the Second Party to permit the Faculty and Students of the First Party to visit its group companies and also involve in Industrial Training Programs for the First Party. This will provide confidence & smooth transition for students work. Also the Second party may register on the AICTE Internship Portal for the benefit of students.

2.2 Guest Lectures: Second Party to extend the necessary support to deliver guest lecturers to the students of the First Party on the technology trends and in house requirements.

2.3 Placement of trained students: second party will actively engage to help the delivery of the training and placement of the students of the first party on the technology trends and in house requirements.

2.4 There is no financial commitment on the part of the **Aliah University, Kolkata.** the first party to take up any program mention in MoU. If there is any financial consideration, it will be dealt separately.

2.5 Both Parties to obtain all internal approvals, consents, permissions, and licenses of whatsoever nature required.

Indranil De Sarkar

CLAUSE 3 VALIDITY

3.1 This Agreement will be valid until it is expressly terminated by either Party on mutually agreed terms, during which period, the Second Part.

CLAUSE 4 Effective Date, Term, Dispute Resolution and Termination

4.1 This MOU will be valid for two (2) years effective from the date of signing of the MOU.

4.2 The achievements and progress upon implementation of this MOU will be reviewed by both the parties at the anniversary of the MOU.

4.3 In the event of any dispute, difference, conflict or question arising between the Parties hereto relating to or concerning or arising out of this MOU, both parties shall endeavor to resolve the same amicably through mutual interactions failing which this MOU may be terminated by either party with a communication to the contact person of the other party.

CLAUSE 5 RELATIONSHIP BETWEEN THE PARTIES

5.1 It is expressly agreed that First Party and Second Party are acting under this MOU as independent contractors, and the relationship established under this MOU shall not be construed as a partnership.

Indrani Dey Sarkar

ARDENT COMPUTECH PVT. LTD. * KOLKATA *

AGREED:

For **Aliah University Kolkata**

(Registrar)
Authorized Signatory

Registrar
Aliah University

Date:

For **Ardent Computech Pvt Ltd**

Indranil De Sarkar

(Director)
Authorized Signatory

Date :

Aliah University	**Ardent Computech Pvt Ltd**
Action Area II, Plot No.- IIA/27, Newtown, Kolkata, West Bengal 700160	Module No-132, Ground Floor, SDF Building, Sector-V, Saltlake, Kolkata-700091
8584853803	9674489000
registrar@aliah.ac.in	indranil@ardentcollaborations.com
https://www.aliah.ac.in/	www.ardentcollaborations.com

Witness1: Md. Jakir Hossain Molla.

Witness2: Bapi Majumdar

Witness3: Sk Hafizur Rahman

Witness4:

BASSETTI

MEMORANDUM OF UNDERSTANDING

THIS MEMORANDUM OF UNDERSTANDING is made on this the 16th day of March, 2022[Two Thousand & Twenty Two];

BY & BETWEEN

BASSETTI ITES PRIVATE LIMITED, a company incorporated under the Companies Act, 1956 and having its corporate office at Salt Lake Electronics Complex, Stesalit Towers, GP Block, Sector V, Kolkata, West Bengal 700091 ,hereinafter referred to the "**EMPLOYER**" (which expression shall unless other-wise repugnant to the context be deemed to mean and include his heirs, executors, Successors, Representatives, Administrators and assigns) of the **FIRST PART**;

AND

ALIAH UNIVERSITY, approved by UGC & AICTE, INC/WBNC & NCTE offers Degree courses on Engineering, Management, Natural Sciences, Humanities, Social Sciences, Languages, Law, Journalism and Mass Communication, Religious Studies (Islamic Theology) and Bachelor of Education of the **SECOND PART**

AND WHEREAS,

BASSETTI ITES PRIVATE LIMITED is a leading IT services, business solutions and outsourcing organization and has a strategic business unit, that focuses on providing large-scale assessment services and

NOW THIS MOU aims to capture the understanding reached between and regarding each other's roles and responsibilities;

Scope of the MOU :

The vision of this collaboration is to address the career skill gap among student community and also to help them gain a head start in their career through the use of a range of courses, certification programs, internships & on-the-job training. The intent is to ensure that the students who cross the academic and aptitude gates do not lose out due to gaps in foundation and soft skills as required by the industry. The parties agree to use best efforts towards fulfilment of their respective commitments in realizing this intent.

Purpose of the MOU:

B

BASSETTI

A. The University mission and values strongly endorse partnerships with the community that advances the quality of life and the educational, intellectual, artistic, civic, cultural and economic aspirations for all those living or working in our neighboring communities. The UNIVERSITY promotes student placements in applied settings as a valued part of a student's education process.

B. The EMPLOYER may state its mission in its bylaws and/or articles of incorporation.

C.The UNIVERSITY and the EMPLOYER recognize the opportunity for positive learning experiences and mutual benefit for each, and for enrolled students (referred to as STUDENT(S)). The UNIVERSITY supports the goals and objectives of the EMPLOYER.

Responsibilities:

The University, Employer and Student interact to ensure that the academic and work experience goals of Internship Education are achieved to the mutual benefit and satisfaction of all parties.

A. The University agrees to:

1. Aggressively screen and match qualified students for referral to work experience opportunities identified by the cooperating employer.
2. Provide qualified students with access to Internship work experience and opportunities.
3. Provide employers with appropriate personal and academic information on qualified student applicants, upon written authorization by the student.
4. Facilitate and coordinate the interview process as a service to both the student and employer and ensure making available the approved time-sheets on which training can be imparted so that training/internship and academic classes go in sync.
5. Award credit to participating students who have met the academic requirements of their program.
6. Inform students and employers of any actions which affect student-employer relations.

B. The Employer agrees to:

1. Inform the T&P Office of Internship Education of all work experience opportunities which have Internship Education potential.
2. Consider for employment all qualified students pre-screened and recommended by the T&P Office of Internship Education.
3. Participate with the University faculty supervisor in the coordination of the student's work experience activities and scheduling.

4. Provide the student with an orientation to the work setting upon initiation of each new internship work experience, as appropriate.
5. Provide the student with meaningful work assignments which, within the confines of employer needs and time-tables, will enhance and complement the student's academic program at the University.
6. Assist the student in the development of specific learning objectives which coincide with the student's career goals and academic programs.
7. Provide students to the extent possible, an overview of all applicable aspects of the industry including organization and management structure, technical and production processes, and major industry, labor, health, environmental, and community issues impacting the business.
8. Evaluate the student's work performance at least once during each internship work experience period. Discuss the evaluation with the student and complete the internship evaluation forms.
9. Handle all personnel processing matters related to the student's employment.
10. Notify the University of any personnel actions taken which may affect the student's standing in Internship Education.
11. Whenever possible, pay the student a wage or salary commensurate with the student's responsibilities, education, experience level and career field.
12. Provide safe and healthy working conditions for the student and not hold the University responsible for any injury, illness or damages resulting directly or indirectly from the student's employment activities.
13. Encourage the student to complete his or her academic program at the University.

C. **The Student agrees to**:

1. Enroll in the appropriate Internship Education course, for the stipulated time in a University- approved Internship Education placement.
2. Attend the initial internship orientation meeting.
3. Continue enrollment in an approved certificate or degree program at the University while participating in a college-approved internship work experience placement.
4. Participate in activities designed to provide an overview of all applicable aspects of the industry.
5. Participate in the student/employer evaluation process.
6. Turn in workbook and all other assignments to the faculty supervisor.
7. Approach responsibility to the employer and University with dedication, enthusiasm, and maturity.

Permanent Employment:

Neither the employer nor the student is bound by this agreement to offer or accept permanent employment, although this is often the outcome of an Internship Education relationship.

BASSETTI

Internship Education placements are not intended to displace current full-time permanent employees of the employer.

This Memorandum of Understandingshall remain validon the mentioned terms and conditions until further notice.

IN WITNESS WHEREOF, the Parties have set and subscribed their respective hands and seals on the date month and year first above written

Bassetti ITES Pvt. Ltd.
Signature of FIRST PART:
ALIAH UNIVERSITY
Signature of SECOND PART:

BASSETTI ITES PVT. LTD.

Registrar
Aliah University
New Town, Kolkata-700 160

Aspire
INSTITUTE

Empowering first-generation college students worldwide

COLLABORATION AGREEMENT

This Collaboration Agreement is entered into as of March 18th, 2024 between Aspire Institute Inc., a Massachusetts corporation recognized as exempt under section 501(c)(3) of the Internal Revenue Code, located at One Mifflin Place, Suite 400, Cambridge MA 02138 ("**Aspire Institute")** and "**Aliah University**", each a **"Party"** and together, the **"Parties."**

THE PARTIES AGREE AS FOLLOWS:

I. PURPOSE OF THE AGREEMENT

The purpose of this Agreement is to set the conditions of collaboration between the Aspire Institute and Aliah University to carry out the Aspire Leaders Program for the purpose of transforming the lives of youth worldwide who are in marginalized situations and enable them to make a positive impact in all aspects of human endeavor. Aspire Institute and Aliah University intend to support youth around the world in defining their academic and professional futures, fostering success through locally harnessed aspirational narratives through this Collaboration.

II. COMMITMENTS

A. Aspire Institute and Aliah University have committed themselves to communicate openly about the Program progress and needs and available resources, adjusting Program plans as needed.

B. Aspire Institute has committed itself to support the Collaboration through administration of the five-stage Program by providing the following services:

1. Administer an application process to admit students who are first-generation college students or recent graduates; between the ages of 18-26 years old; and from a low-income background.

2. Enable admitted students to gain access to a fully funded program and leadership development tools, participate in live seminars with Harvard and world-class faculty, and exchange ideas in a virtual classroom with a global community of peers.

3. Provide students access to personal and professional development opportunities including self-assessment tools and mentorship by seasoned professionals.

4. Connect students to the Aspire alumni network, a dynamic and diverse group spanning countries around the world.

C. Aliah University has committed itself to support the Collaboration by providing the following assistance

1. Be a conduit for Aspire Institute's presence globally and serve as an extension of the Cambridge headquarters.

2. Support students in-country through all stages of the Program, starting with their application and continuing through their experience, as needed.

3. Support in-country events and initiatives to help spread the information on the Aspire Leaders program.

4. Host Alumni events in the country to bring Aspire alums together for networking and exchanging ideas that will positively impact the local communities when possible.

III. REPORTING

Aliah University will work with Aspire Institute to have regular check-ins, meetings, and report on impact.

IV. REGULAR MEETINGS

A. The parties shall regularly communicate about all relevant matters about the Collaboration. Teams from Aspire Institute and Aliah University will hold regular meetings each application cycle to review progress, share any new developments, gather feedback on the activities and identify unmet needs or challenges. and adjust activities conducted under the Collaboration.

B. Each Party shall promptly inform the other Party about any unforeseen results, problems, difficulties, etc. about the Collaboration.

V. CONTACT INFORMATION

Unless the recipient provides a different address in writing, communications should be delivered to the following contacts:

Aspire Institute, Inc.	Name
Contact: Meena Sonea	Contact
Title: Executive Director	Title
Phone:617-291-2101	Phone
Email address:meena@aspireleaders.org	Email Address

VI. FUNDING

Each Party is responsible for raising and administering the funds needed to support its own commitments under this Agreement. Neither Party has an obligation to provide funding to the other.

VII. COMPLIANCE WITH LAW, REGULATIONS, INDUSTRY STANDARDS, GUIDELINES, AND POLICIES

A. In exercising its rights and performing its obligations under this Agreement, either Party shall:

1. not promise, offer, pay, cause to pay, accept payment or induce payment or take any action that could be considered a bribe;

2. comply with all applicable laws and regulations (including, without limitation, those related to health, safety and the environment, anti-corruption and anti-bribery, fair labor practices, unlawful discrimination and data privacy
requirements according to applicable law;

3. perform its obligations with high ethical and moral business and personal integrity standards.

B. Each Party warrants that it does not advocate, support, assist or engage in, and has not advocated, supported, assisted or engaged in, any illegal or terrorist activity. Each Party further warrants that it does not employ, support, assist or otherwise associate with any entities, organizations or individuals that the Party knows, or has reason to know, support terrorism or that appear on any official terrorist lists published by the U.S. Government, the United Nations or the European Union.

VIII. CONFIDENTIALITY

Each Party may communicate to the other proprietary, confidential and other information during the term of this Agreement. Each Party shall treat all such information as confidential, whether requested to do so or not, and shall take all such reasonable precautions to prevent the unauthorized disclosure of any part of such information to any person outside its organization including, without limitation, taking all those precautions which each Party uses to safeguard its own confidential information.

Such obligation of confidentiality shall survive the expiration or early termination of this Agreement and shall not apply to (i) information that is or becomes available in the public domain through no wrongful acts of either Party; and (ii) information disclosed pursuant to any court or regulatory order served upon either Party, provided that either Party gives the other prompt notice of such order.

IX. PUBLICITY AND MATERIALS.

A. The Parties shall discuss and mutually agree upon any press releases relating to this Agreement prior to their release or distribution. Either Party may release reports on the

Collaboration efforts, and approval of such reports shall not be unreasonably withheld.

B. Aliah Universityshall provide Aspire Institute copies of all publications, articles, manuscripts, training, presentations and other educational or informational materials (collectively, "Informational Materials") that it produces in connection with the Collaboration.

C. All Informational Materials produced by the Aliah University shall include the following language: Aliah University is a partner in the Aspire Leaders Program, a project developed by Aspire Institute, Inc. to empower low-income, first-generation college students worldwide to reach their full potential.."

D. Aliah University agrees that any photos or videos ("photos") of individuals related to the Program will be taken and used in an appropriate and respectful manner. Aliah University agrees to provide to Aspire Institute evidence of written consent from any individual identifiable in photos giving Aspire Institute permission to use such photos for non-commercial purposes.

X. TERM AND TERMINATION

A. The term of this Agreement is one year, commencing on the Effective Date 18th March 2024, with the possibility of renewal at the end of the term.

B. This Agreement may be terminated by either Party by giving prior written notice to the other Party of at least sixty (60) days with or without cause.

XI. MISCELLANEOUS

A. **Assignment**. This Agreement shall not be assignable by either Party without the prior written consent of the other Party.

B. **Conflicting obligations**. The parties covenant and represent that either of them has full right and authority to enter into this Agreement and to accept all the obligations under this Agreement, that they have no obligations with any third Party which might be in conflict with their obligations under this Agreement, and that they will during the term of this Agreement not enter into such obligations without the prior written consent of the other Party. In the event that one of the parties develops or becomes aware of a conflict of interest during the performance of this Agreement, it will inform the other Party in a prompt manner.

C. **Notices**. Any notice required or authorized to be served hereunder shall be deemed to have been properly served if sent by express Courier or electronic mail with receipt confirmed to the Party to be served at the address specified by such Party for that purpose, or, if no such address is specified, at the address given at the head of this Agreement.

D. **Entire Agreement**. This Agreement represents the entire agreement and understanding between the parties relating to the subject matter of this Agreement

and supersedes all documents or verbal consents or understandings (if any) given or made between the parties prior to the date of this Agreement.

E. **Modification and Waiver**. No waiver, amendment or modification of this Agreement will be binding upon either Party unless made in writing and signed by authorized representatives of the parties, and no failure or delay in enforcing or exercising any right will be deemed a waiver.

F. **Severability.** In the event any provision of this Agreement is held to be illegal, invalid or unenforceable, such provision shall be limited or eliminated to the minimum extent necessary so that this Agreement otherwise remains in full force and effect.

G. **Independence**. In performing the Collaboration, the parties are acting as independent contractors and nothing in this Agreement nor the activities by the parties under this Agreement will be deemed to constitute an agency, employee, partner, joint venture or legal representative relationship between the parties for any purpose.

H. **Counterparts**. This Agreement may be executed in two or more counterparts, either of which shall be deemed an original, but all of which together shall constitute the same instrument.

I. **Governing Law and Jurisdiction**. This Agreement is intentionally silent with respect to governing law and jurisdiction.

By signing below, the Parties indicate that they have reviewed the contents of this Agreement and that it accurately reflects their understanding and intentions with regard to the arrangements described therein:

Registrar (Officiating)

Date 18th March, 2024

Registrar (Officiating)
Aliah University
New Town, Kolkata-700160

Meena Sonea
Executive Director, Aspire Institute

Information and Library Network Centre
(An Autonomous Inter-University Centre of UGC)

सूचना एवं पुस्तकालय नेटवर्क केन्द्र
(विश्वविद्यालय अनुदान आयोग का स्वायत्त अंतर विश्वविद्यालय केन्द्र)

INFLIBNET

Manoj Kumar K.
Scientist D (CS)

INFL/Shodhganga/MoU /AC/235/2019/01 18th January, 2019

To

Dr. Nursadh Ali
Registrar,
Aliah University,
Action Area IIA/27, New Town,
Kolkata,
West Bengal -700 160
Phone: + 03323416404

Asst. Librarian

Sub: MoU for Shodhganga-regd.

Dear Sir,

Greeting from INFLIBNET Centre. Wish you a very Happy New Year. We would like to thank you for the initiative and signing the MoU to join the Shodhganga/Shodhgangotri project. Please refer to your letter dated 2nd January, 2019 enclosing there with two copies of the MoU duly signed for the Shodhganga/Shodhgangotri. We appreciate your effort for promoting '**Shodhganga:** Repository of about 2,13,000 Indian Electronic Theses and Dissertations'.

Enclosed please find one copy of the MoU duly signed by us for your record and retention. You are requested to kindly instruct your Ph.D scholars/Officials to start submitting their theses online to the Shodhganga repository and student research scholars to submit synopses to Shodhgangotri as per the UGC Notification (Minimum Standards & Procedure for Award of M.Phil. / Ph.D Degree, Regulation dated 1st June 2009/2016). If soft copies are available, you may kindly pass on to us in CD/DVD after following **latest UGC Regulations** (Promotion of Academic Integrity and Prevention of Plagiarism in Higher Educational Institutions), 2018. For more details and help to upload, you may please visit http://shodhganga.inflibnet.ac.in/manual/.

With regards,

Yours Sincerely,

(Manoj Kumar K.)

INFLIBNET Centre

Memorandum of Understanding (MoU) for Shodhganga/Shodhgangotri

(A Repository of Theses and Dissertations submitted to the Universities in India)

This Memorandum of Understanding (MoU) is made and entered into on 02 (Day) 01 (Month) 19 (Year) between the INFLIBNET Centre, an IUC of University Grants Commission located at Gandhinagar, hereinafter referred to as "INFLIBNET" and ALIAH UNIVERSITY (University / Deemed University / Inter-University Centre), here in after referred to as the '**University**'.

WHEREAS, INFLIBNET Centre, an Inter-university Centre of the University Grants Commission, as its mandate, promotes open access to scholarly content generated in universities. The Centre has computers, network, software infrastructure and technical know-how required for hosting electronic versions of theses and dissertations in open access with interface to search, retrieve and access these content.

WHEREAS ALIAH UNIVERSITY (University / Deemed University / Inter University Centre) has agreed to take part in the process of digitisation of old theses and dissertations (not available in computerized machine-readable format) and building-up of digital repository and to promote, share and host its ETD in 'Shodhganga: A reservoir of Indian theses submitted to the Universities in India' and other universities in open access. 'Shodhganga' is a name coined by INFLIBNET Centre for refering to the respository of Indian Electronic Theses and Dissertations. The word "Shodh" originates from Sanskrit and stands for research and discovery. The 'Ganga' is the holiest, longest and largest river in Indian subcontinent which has held heart of its people captive and drawn millions of people to its banks since the dawn of history. The Ganga is the symbol of India's age-long culture and civilization, ever changing, ever flowing, ever loved and revered by its people. "Shodhganga", a repository of theses and dissertations submitted to Indian universities, is expected to keep growing to a formidable size as more and more researchers from India submit their research works to this ever growing reservoir. Under the initiative called "ShodhGangotri", research scholars / research supervisors in universities are requested to deposit electronic version of approved synopsis submitted by research scholars to the universities for registering themselves for the Ph.D programme.

This Memorandum of Understanding (MoU) defines responsibilities, liabilities and commitments of the institutions involved to ensure proper system implementation, to meet the objectives pertaining to submission and access to Electronic Theses and Dissertations as envisaged by the UGC vide its Notification (Minimum Standards & Procedure for Award of M.Phil/Ph.D Degree), Regulation, 2009 dated 1st June, 2009.

NOW, THEREFORE, in consideration of the mutual agreements herein contained, INFLIBNET and the University agree to the following terms and conditions:

I. **INFLIBNET Centre**

1. Provide access to ETD hosting server(s) at the INFLIBNET Centre 'Shodhganga'/'Shodhgangotri' to the University with accompanied software interface enabling University / its student to create metadata and upload their theses and dissertations in ETD repositories designed for this purpose. The INFLIBNET will take the responsibility of keeping the data intact and usable, keep back-up of the data so as to avoid its loss. The INFLIBNET will deploy

Registrar
Kolkata-156

tools and techniques of digital preservation to ensure continuing access to scholarly content in digital formats and to protect them from media failure, physical loss and obsolescence.

2. Recommend to the UGC to extend financial assistance to the Universities under Sections 12(B) and 2(f) of UGC Act for digitization of theses and dissertations not available in computerized machine-readable format and / or for procurement and installation of a suitable computer system / infrastructure for creation of ETDs.

3. Provide configuration of system, specifications and technical guidance to the University for procurement of computer hardware and related systems for setting-up of ETDs.

4. Provide guidelines, technical standards and specifications for digitization of Ph.D. theses submitted to the university in past and for theses not available in computerized machine-readable format.

5. Impart training to at least one person from the university (from library field and / or from computer field) in creation, updation and computerized operation of digital repositories of ETDs especially on 'Shodhganga'.

6. Extend access to an anti-plagiarism software or provide services to evaluate theses for possible plagiarism and submit a report to the concerned university.

7. The INFLIBNET may refuse to host any material deemed by the INFLIBNET to be controversial in nature or is in violation of copyright act.

8. This right of refusal will not relieve the University / Ph.D. scholar of liability, both to INFLIBNET and to the public, for matter contained in the theses that may be libelous or actionable and to both INFLIBNET and copyright owners for copyright infringement by the Ph.D. Scholar.

9. The INFLIBNET Centre will not be responsible for i) errors, omissions, inaccuracies and quality of content or misinformation or for any damages caused to the user or any third party from the use of content provided in the theses; ii) safety and archiving of loaded content in cases of "force majeure" including natural calamities; and iii) printed version of theses.

10. INFLIBNET Centre will recommend or provide access to plagiarism software which university may use to detect plagiarism before awarding the degree.

11. The INFLIBNET Centre replicates the content of theses and dissertations on different server and other auxiliary storage media. However, the INFLIBNET Centre does not take the responsibility for the archiving or backing-up of loaded content. The universities, therefore, should also keep a back-up of their theses and dissertations.

Registrar
Aliah University
New Town, Kolkata-156

12. INFLIBNET Centre also maintains a repository called "Shodhgangotri" for hosting the approved synopses of research topic submitted to the universities by the students for registering themselves under the doctoral programme. Research students/their supervisors are encouraged to submit approved synopses/research proposals and register their priority on a research proposal through the repository.

II. The University

1. The University would grant non-exclusive worldwide license to the INFLIBNET Centre for hosting and distributing their theses in digital format in 'Shodhganga'/ 'Shodhgangotri' or any other server designated for this purpose.

2. The University / its researcher scholars agree to host / upload a computerized machine-readable file in mutually agreed format of all theses on to the 'Shodhganga'/'Shodhgangotri' server at the INFLIBNET.

3. The University will not hold INFLIBNET Centre responsible for any errors and omissions contained in the original theses.

4. The University commits to digitize theses and dissertations and their bibliographic records submitted to the university and provide necessary infrastructure including manpower support for operation of ETDs.

5. Commits to utilize the assistance provided by the UGC on recommendation of the INFLIBNET for implementation of ETDs including their digitization.

6. Deputes at least one person from the university (from library field or from computer field) for undergoing training on implementation of ETD organized by the INFLIBNET and ensure that the person trained by INFLIBNET on ETD is / are deployed for the same job.

7. Arranges to provide training to research scholars or users of its library and staff of colleges affiliated to University in creation of electronic version of theses and their deposition in the ETDs.

8. Ensures use of standard software and metadata schema suggested / provided by the INFLIBNET for setting-up / development / operation of its ETDs .

9. Creates bibliographic records of all theses and dissertations submitted to the university in standard bibliographic formats prescribed by the INFLIBNET Centre from time-to-time and contributes these records for inclusion in the INFLIBNET's Union Catalogue (IndCat).

10. Commits to sharing of library ETD resources / databases with the INFLIBNET Centre as well as with other universities.

Registrar
-h University
Kolkata-156

11. The University would agree to host their ETDs in the digital repositories 'Shodhganga or other servers' set-up at the INFLIBNET Centre, and grant non-exclusive licence to the Centre to make electronic version of theses in full-text (theses that are born digital as well as those that are digitized using scanners / digital cameras) accessible through open access ETD.

12. The University shall not use electronic version of theses digitized using funds given by the UGC for any commercial purposes. The University shall not rent, sell or license the use of or deliver or release or otherwise part with the possession of the systems / software or the INFLIBNET ETDs databases, Shodhganga or any part thereof to any other party (individual, institution, organization, etc.)

13. The University will also commit their own funds or grants for fulfillment of the project, if the project on implementation of ETDs demands more resources and funds to complete it.

14. The University will use the plagiarism software recommended by the INFLIBNET and made accessible to test the thesis submitted by the student for plagiarism before awarding the Degree. If the university is not subscribing to such software, it will use the software from the nearest Regional Centre, if any.

15. University would encourage and ensure that Research Scholars/ Research Supervisors deposit host their approved Research Proposals/ approved synopses on the "Shodhgangotri" once Ph.D. is registered.

III. Termination

Both, the Parties, will have rights to terminate the MoU at any time in case of breach of obligations and terms and conditions of the MoU. This MoU signed hereunder may be terminated by either party at anytime upon ninety (90) days prior written notice. Upon termination of this Agreement, the INFLIBNET / University will stop hosting their theses immediately while keeping the theses already deposited by the University in its archives for its users. The University shall stop using the INFLIBNET's ETD facilities and databases and return any software / hardware or digitized content provided by or through the INFLIBNET, back to INFLIBNET within the 3 months notice period.

IN WITNESS WHEREOFF, the parties hereto executed this MoU on this date above mentioned.

UNIVERSITY:

Vice Chancellor / Registrar
or designated authority.

(Name, Signature and Seal)

INFLIBNET:

16/4/2019

Director
INFLIBNET Centre,
An IUC of University Grants Commission
Infocity, Gandhinagar - 382 007.

Prof J P Singh Joorel
Director
INFLIBNET Centre(UGC)
Infocity,Gandhinagar-382007

INFLIBNET CENTRE ★ AN IUC OF UGC ★ GANDHINAGAR

6.12.18

DR. NURSADH ALI

REGISTRAR
Registrar

LINKAGE FOR ACADEMIC COLLABORATION

Linkage for Academic Collaboration

This Academic Linkage is made and entered into force this **18th December, 2019**

Between

Dr. Abhijit Guha

Convenor, Ph.D. RAC, SVCMRES & Associate Professor
Department of Education
Ramakrishna Mission Sikshanamandira
P.O. Belur Math, Howrah- 711202, West Bengal **(First Party)**

And

Dr. Reshma Khatun

Assistant Professor
Department of Education,
Aliah University
Kolkata, West Bengal **(Second Party)**

1. INTRODUCTION

After detailed discussion, the first party and the second party chalked down the areas of cooperation in detail and agreed to provide research consultancy to the students / scholars in the field of Education. Both parties decided that an academic linkage will be of much help in this regard and agreed to establish an academic linkage.

Now both the parties agreed to establish the academic linkage with the following conditions

2. OBJECTIVES OF THE LINKAGE:

The Objectives of this Academic Linkage are as follows:

1. To provide academic support in research work in the field of education.

2. To held discussion, whenever necessary, for the purpose of setting and defining research problem.

3. To provide support in the task of literature review and to identify research gap for the research work.

4. To provide support in tool development and validation for research work.

5. To provide support in arranging data collection from academic institutions.

6. To provide support in data analysis and interpretation in research work.

3. RESPONSIBILITIES OF DR. ABHIJIT GUHA

1. As and when necessary, Dr. Reshma Khatun will communicate Dr. Abhijit Guha for the necessary consultation (as per mentioned areas in the objectives). Dr. Abhijit Guha will fix a schedule for the consultation as per convenience of both the parties. Both the parties will meet in the institution and necessary assistance will be given by Dr. Abhijit Guha to Dr. Dr. Reshma Khatun or her students/ scholars.
2. In case of review of research literatures, on the intimation regarding library work by Dr. Reshma Khatun necessary arrangement will be made by Dr. Abhijit Guha for the library work in his institution.
3. For tool validation, Dr. Reshma Khatun will send the tool with a forwarding letter to Dr. Abhijit Guha. On receiving the tool, Dr. Abhijit Guha will validate the tool and return back the validated tool having signed on it within 10-15 days to Dr. Reshma Khatun.
4. For the purpose of data collection, Dr. Abhijit Guha will provide support and arrange condition to collect data from his institution i.e. Ramakrishna Mission Sikshanamandira. He may also give necessary information and introduction to other places where from data can be collected.
5. In case of assistance for data analysis, tabulated raw data has to be provided by Dr. Reshma Khatun. After the analysis of the data, Dr. Abhijit Guha will provide the result (soft copy) and necessary meeting will be arranged by Dr. Abhijit Guha for the interpretations and discussion of the results.

4. RESPONSIBILITIES OF DR. RESHMA KHATUN

1. As and when necessary, Dr. Abhijit Guha will communicate Dr. Reshma Khatun for the necessary consultation (as per mentioned areas in the objectives). Dr. Reshma Khatun will fix a schedule for the consultation as per convenience of both the parties. Both the parties will meet in the institution and necessary assistance will be given by Dr. Reshma Khatun to Dr. Abhijit Guha or his students/ scholars.
2. In case of review of research literatures, on the intimation regarding library work by Dr. Abhijit Guha, necessary arrangement will be made by Dr. Reshma Khatun for the library work in her institution.
3. For tool validation, Dr. Abhijit Guha will send the tool with a forwarding letter to Dr. Reshma Khatun. On receiving the tool, Dr. Reshma Khatun will validate

the tool and return back the validated tool having signed on it within 10-15 days to Dr. Abhijit Guha.

4. For the purpose of data collection, Dr. Reshma Khatun will provide support and arrange condition to collect data from her institution i.e. Department of Education, Aliah University. She may also give necessary information and introduction to other places where from data can be collected.
5. In case of assistance for data analysis, tabulated raw data will be provided by Dr. Abhijit Guha. After the analysis of the data, Dr. Reshma Khatun will provide the result (soft copy) and necessary meeting will be arranged by Dr. Reshma Khatun for the interpretations and discussion of the results.

5. FINANCIAL ARRANGEMENTS

There is no financial obligation under this Linkage.

6. TERMINATION OF LINKAGE

This Linkage may be terminated by either of the parties forthwith if either Dr. Abhijit Guha or Dr. Reshma Khatun commits breach of any of the terms hereof and shall have failed to rectify such breach within thirty days of the notice.
In addition to the reasons for termination as set forth above, this Linkage may be terminated forthwith if either of Dr. Reshma Khatun and Dr. Abhijit Guha voluntarily or involuntarily enters into official dilution.

7. DURATION-

This Academic Linkage shall remain valid for a period of 5 years only from the date of signing the Linkage. After this 5 years' time period, this Linkage may be terminated or may be renewed after judging the then situation.

8. SETTLEMENT

Upon termination of the Linkage, all rights granted to and the obligations by Dr. Reshma Khatun and Dr. Abhijit Guha hereto, shall cease to exist forthwith.

9. AMENDMENTS TO THE LINKAGE

No amendment or modification of this Linkage shall be valid unless the same is made in writing by both Dr. Abhijit Guha and Dr. Reshma Khatun; to be an amendment of this Linkage. The modifications/ changes shall be effective, from the date on which they are made/executed; unless otherwise agreed to. In general, the Linkage will be amended on yearly basis, IF AT ALL REQUIRED, on mutually agreed terms.

LINKAGE FOR ACADEMIC COLLABORATION

10. SIGNATURE OF THE PARTIES

This Linkage has been executed in two originals, one of these has been retained by Dr. Abhijit Guha and the other has been retained by Dr. Reshma Khatun.
In witness whereof the parties hereto have signed this Linkage the day, month and year mentioned hereinbefore.

Institute	Ramakrishna Mission Sikshanamandira	Department of Education, Aliah University
Address	Belur Math Campus, Belur Math, Howrah, West Bengal 711202	9th Floor, Park Circus Campus, 17, Gora Chand Road, Kolkata-700 014.
Department	Department Education	Department of Education
Party	First Party	Second Party
Name	Dr. Abhijit Guha	Dr. Reshma Khatun
Designation	Convenor, Ph.D. RAC, SVCMRES & Associate Professor	Assistant Professor Department of Education, Aliah University
Signature with official seal & Date	18/12/2019 Dr. Abhijit Guha Associate Professor in Education Ramakrishna Mission Sikshanamandira (Autonomous Post Graduate College of Teacher Education) Belur Math, Howrah-711202	18/12/2019 Assistant Professor Department of Education Aliah University, Kolkata
Full Signatures of the witnesses	1. Assistant Professor 18/12/2019 Ramakrishna Mission Sikshanamandira A Post-Grad ... Autonomous College ... Education ... Howrah	1 16/12/2019 Assistant Professor Department of Education Aliah University, Kolkata
	2. Assistant Professor 2019 Ramakrishna Mission Sikshanamandira A Post-Graduate Autonomous College of Teacher Education Belur Math, Howrah	2. 18/12/19

Gmail

Moumita Chatterjee <mcmoumita8@gmail.com>

SERB-Notification

SERB_Administrator@serbonline.in <SERB_Administrator@serbonline.in> Mon, May 8, 2023 at 1:58 PM
To: serbinfo1@gmail.com

Science and Engineering Research Board

(Statutory Body Established Through an Act of Parliament : SERB Act 2008)
Department of Science and Technology, Government of India

SCIENCE & ENGINEERING RESEARCH BOARD (SERB)

(Statutory Body Established Through an Act of Parliament : SERB Act 2008)

Science and Engineering Research Board
3rd & 4th Floor, Block II
Technology Bhavan, New Mehrauli Road
New Delhi - 110016

Approval Letter

File Number: SUR/2022/001475

Dated: 08-May-2023

Subject: Project titled "A Study of the Survival functions for recurrent and alternating recurrent events with discrete time to event data".

Dear Dr. Moumita Chatterjee,

The project cited above has been recommended by the related **State University Research Excellence (SERB SURE)** to the Science and Engineering Research Board (SERB) for funding. The following are the items recommended for a period of 3 years. The final budget to be sanctioned would be based on quotations received, existing norms, funds availability etc.

The committee recommended the following budget

Manpower : -> Project Associate-I - 1
Equipment Details : Rs. 200000
-> Laptop Computer - 1
Consumables : Rs. 150000

Travel Cost : As per norms
Contingencies : As per norms
Overhead : As per norms

You need to accept the above budgetary allocation before proceeding further. To accept the budgetary recommendations , you may follow the following steps :

1. Go to www.serbonline.in through your credentials

2. Go to Menu --> Proposal submission --> View submitted proposals

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The sunlight-driven photosalient effect of a 1D coordination polymer and the release of an elusive cyclobutane derivative†

Basudeb Dutta,[a] Chittaranjan Sinha[b] and Mohammad Hedayetullah Mir*[a]

A one-dimensional coordination polymer (1D CP) [Zn(glu)(4-nvp)] (1) [H_2glu = glutaric acid and 4-nvp = 4-(1-naphthylvinyl)pyridine] with a paddle-wheel unit [$Zn_2(O_2CC)_4$] exhibits the photosalient effect under UV as well as sunlight irradiation, resembling the popping of popcorn, along with the release of an elusive cyclobutane ligand.

The solid-state reaction has been established as a method restricting molecular movement, leading to the formation of stereospecific and regioselective products that may be inaccessible through solution or gaseous synthesis.[1] In the solution or gaseous state, the function of molecular movement is high. Thus, the unlocked functional groups are brought closer in a variety of arrangements, allowing diversity in the stereoselective products. However, the solid-phase reaction is predictable due to the confirmation of molecular structures. In many cases, single-crystal to single-crystal (SCSC) transformations take place, and thus, single-crystal X-ray crystallography helps to determine the structure of the final product unequivocally.[2] In this aspect, stimuli-responsive solid-state reactions are manifested in terms of consecutive bond breaking and bond making, which result in the modifications of geometry, dimensionality, chirality, coordination number and interpenetration.[3,4] Sometimes, the above modifications may happen along with the conversion of energy to work. Such visually appealing conversion may provide a useful opportunity to upgrade the mechanical link among molecular functions, supramolecular processes and their consequences at the macroscopic level. In this regard, the light-induced mechanical effect of crystals is gaining special interest for its potential future applications in electrochemical, smart medical and memory devices, artificial muscles, sensors, and probes.[5,6]

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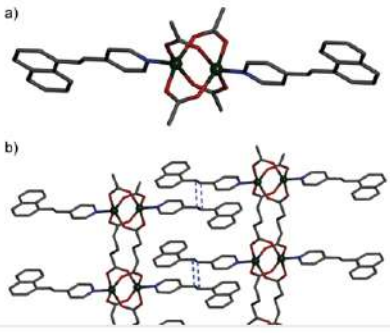
† Electronic supplementary information (ESI) available: Details of the synthesis, elemental analysis, Fig. S1–S14, Tables S1–S5 and X-ray crystallographic data. CCDC 1911202 (1) and 1911203 (2). For ESI and crystallographic data in CIF or other electronic format see DOI: 10.1039/c9cc06016b

Among the solid-state syntheses, photochemical [2+2] cycloaddition reactions have attracted immense interest because of the eco-friendly green process.[7] Recently, Vittal *et al.* reported the [2+2] photodimerization reaction of discrete coordination metal complexes accompanied by violent shattering of crystals under UV light, known as "photosalient effect".[8] However, to the best of our knowledge, there have been no reports of such phenomenon in coordination polymers (CPs). Herein, we report the first example of a one-dimensional (1D) CP, [Zn(glu)(4-nvp)] (1) [H_2glu = glutaric acid and 4-nvp = 4-(1-naphthylvinyl)pyridine], which shows photosalient effect. In the presence of UV light, the crystals pop so much so that they disintegrate into powder debris. Surprisingly, the popping of crystals has also been observed in presence of sunlight, although the phenomenon is sluggish. Furthermore, during recrystallization of the powder residue in ethanol, an elusive cyclobutane ligand is isolated. Usually, such organic moieties cannot be easily fabricated *via* conventional synthetic procedures. Vittal *et al.*, MacGillivray *et al.*, and others have engineered some cyclobutane ligands *via* template-directed synthesis.[9,10] Recently, Han *et al.* also reported the synthesis of a few cyclobutane derivatives in solution.[11] Here, we have been able to synthesize the cyclobutane derivative in the solid-state reaction and isolate the ligand *via* recrystallization. In a nutshell, we have designed a new CP, observed its photosalient mechanical feature and isolated the stereoselective novel ligand.

Light-yellow block-shaped crystals of **1** were obtained by diffusing H_2glu and 4-nvp in ethanol into the aqueous solution of $Zn(NO_3)_2{\cdot}6H_2O$ and Et_3N in DMF/MeOH. The X-ray crystallographic experiment reveals that compound **1** crystallizes in $P\bar{1}$ with $Z = 2$. The asymmetric unit consists of one Zn(II) centre, one glutarate dianion and one 4-nvp ligand. Two Zn(II) centres are equivalently bridged by four μ_2,η^2-carboxylate groups from four different glutarate ligands to form a dinuclear $[Zn_2(O_2CC)_4]$ paddle-wheel secondary building unit (SBU) (Fig. 1a). The distance between the Zn(II) centres is 2.934 Å. The SBUs are bridged by dicarboxylate spacer ligands to generate a 1D chain structure. Here, the flexibility of the glutarate ligand does not allow the paddle-wheel unit to propagate in the second direction. As a



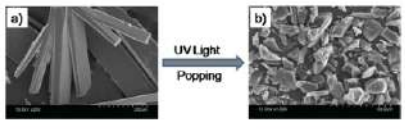


Fig. 2 FESEM images of crystals of **1** (a) before the UV irradiation and (b) after popping under UV irradiation.

and shattering
photodimeriza
(Fig. 3), there i
unit cell during
photochemical [2+2] cycloaddition along the *b*-axis, and thus, the unit cell would expand along the *a*- and *c*-axes.[8] As a result,

Sunlight-Induced In Situ Isomerization of Both Ligands in a Mixed-Ligand Coordination Polymer: From Photosalient to Photoinert Crystals

Basudeb Dutta[+],[a, b] Sambhunath Bera[+],[a, b] Chittaranjan Sinha,[c] and Mohammad Hedayetullah Mir*[a]

Abstract: Reaction of $Zn(NO_3)_2 \cdot 6H_2O$, maleic acid (H_2mal) and *trans*-4-(1-naphthylvinyl)pyridine (*trans*-nvp) in the dark results in the formation of a one-dimensional coordination polymer (1D CP) [Zn(mal)(*trans*-nvp)] (**1**), which is photosalient in nature. The crystals of **1** pop violently under UV light and moderately in sunlight, and generate cyclobutane ligands. However, the same reaction mixture kept in visible light exhibits the rare example of in situ isomerization of both ligands: *cis-trans* transformation of maleate and *trans-cis* isomerization of the nvp ligands, and subsequent formation of another 1D CP [Zn(fum)(*cis*-nvp)$_2$(H_2O)$_2$] (**2**, H_2fum = fumaric acid), which is found to be photoinert. Thus, altering the reaction condition from dark to visible light gives rise to photosalient to photoinert crystals.

Since the beginning of universe, light energy plays pivotal role in the existence of living body as well as the functioning of non-living objects.[1–3] Photoactuating molecular systems exhibiting conformational switching, movement, popping or some other mechanical effect may possess potential applications in remotely controlled devices, sensors, optical recording, defense field devices, storage devices and drug delivery process.[4–7] Ideally, such photoactuators would function without being any physical contact with the controlling system and reveal visually appealing mechanical effect i.e. photosalient effect.[8–12] These noncontact actuators have a prospect of converting light energy to mechanical energy. In view of present energy crisis situation and environmental issues, this process may have excellent donation towards future research on smart materials and laboratory to land applications.[13–15] Judicious selection of chemical moieties, such as diazo (N=N), imine (C=N), alkene (C=C), carbonyl (C=O) and hydroxide (O–H) may promote photoinduced structural modification followed by macroscopic motions.[11] Here, fundamental features of chemistry play the crucial role during the breaking and formation of bonds or geometrical rearrangements through conformational and configurational isomerization. In this regard, *cis-trans* photoisomerization may occur in cinnamates, vinylenes, stilbenes, imines and azo-benzenes.[13,16–17] Usually, the azo-benzene and its derivatives exhibit photoisomerization or photochromism in visible light because of low bond energy of 'N=N' bond (bond energy 418 kJ/mol) as compared to C=C (bond energy 602 kJ/mol) and C=N (bond energy 615 kJ/mol) bonded species. Till date, a number of N=N based coordination compounds (monomeric and polymeric) are reported which demonstrate photoisomerization along with mechanical effects such as bending and curling etc.[18–20] However, *cis-trans* photoisomerization in olefinic C=C based coordination polymers (CPs) is rare and remains highly unexplored.[21] This transformation in CPs in presence of visible light is further scarce.

On the other hand, [2 + 2] cycloaddition reaction in CPs under light-illumination (UV or sunlight) is well studied by Vittal, MacGillivray, Naumov and few other groups along with our group.[22–26] In this case, systematic packing of olefinic C=C bonds of a compound after following the Schmidt's topochemical principle undergoes photodimerization in a single-crystal to single-crystal (SCSC) or crystal to crystal manner. One of the first mechanical effects based on [2 + 2] dimerization was reported by Naumov group in 2010.[27] Besides, photosalient effect was previously observed in organic materials[28] and discrete complexes.[6] However, mechanical effects accompanied by photodimerization in CPs are still scarce in literature. Of CPs, this observation has been found in few cases for one-dimensional (1D) CPs[29–32] reported by Vittal and our groups and only two reports for two-dimensional (2D) CPs[33–34] depicted by Lang group.

In the present work, we report a rare example of syntheses of two structurally different 1D CPs by altering the reaction conditions from dark to visible light via in situ isomerization of both the ligands. Keeping the reaction mixture of Zn-

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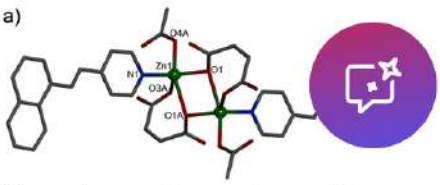
$(NO_3)_2 \cdot 6H_2O$, maleic acid (H_2mal) and *trans*-4-(1-naphthylvinyl)pyridine (*trans*-nvp) in dark results the production of rod shaped crystals, which reveals the formation of 1D CP [Zn(mal)(*trans*-nvp)] (**1**). However, the same reaction mixture kept in visible light results in the isolation of platy crystals of another 1D CP [Zn(fum)(*cis*-nvp)$_2$(H_2O)$_2$] (**2**, H_2fum = fumaric acid). Here, maleate ligand undergoes *cis-trans* isomerization, while *trans*-nvp transforms into *cis*-nvp in solution under visible light to generate compound **2**. Interestingly, the rod shape



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Construction of a Succinate-Bridged Cd(II)-Based Two-Dimensional Coordination Polymer for Efficient Optoelectronic Device Fabrication and Explosive Sensing Application

Basudeb Dutta, Abhijit Hazra, Arka Dey, Chittaranjan Sinha, Partha Pratim Ray,* Priyabrata Banerjee,* and Mohammad Hedayetullah Mir*

Cite This: *Cryst. Growth Des.* 2020, 20, 765−776 Read Online

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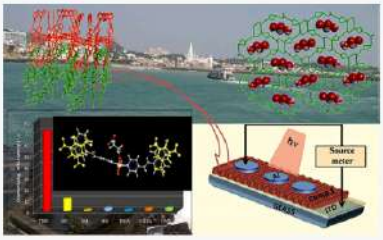
ABSTRACT: A newly designed multifunctional two-dimensional coordination polymer (2D CP) $\{[Cd(suc)(4\text{-nvp})_2]\cdot 2H_2O\}_n$, (**1**), ($H_2$suc = succinic acid and 4-nvp = 4-(1-naphthylvinyl)pyridine) has been synthesized and characterized by X-ray crystallography. The solid-state structure of the compound **1** reveals the formation of three-dimensional supramolecular architecture via C−H···π and π···π stacking interactions. Interestingly, the supramolecular assembly of compound **1** exhibits electrical conductivity in the semiconducting nature. A deep insight into the electrical study of compound **1** carried out by dielectric characterization reveals the enhancement of conductivity upon light soaking. Thus, the compound has potential applicability in the fabrication optoelectronic devices. On the other hand, compound **1** shows sensing activity toward explosive nitroaromatic compounds (epNACs), which threatens devastating terror attacks ultimately responsible for massive loss of life. Besides, the nitroaromatic compound (NAC) 2,4,6-trinitrophenol (TNP) can enter inside the mammalian digestive cycle, wherein it gets metabolized into a mutagenic species, picramic acid, which causes health hazards. Compound **1** can detect TNP with the most acceptable fluorescence method. Together with its optoelectronic device fabrication and explosive sensing application, the synthesized material can be used as a potential candidate for sustainability.



INTRODUCTION

In the history of functional materials chemistry, coordination polymers (CPs)[1−5] or coordination networks (CNs)[6−10] are outstanding performers not only due to their structural or functional diversity but also because of their extensive thermal and chemical stability. CPs and CNs are the polymeric form of coordination complexes, where metal ions or metal clusters are linked via different organic ligands. Here, metal or ligand systems are judiciously chosen according to the desired field of application. The above-discussed metal−organic polymeric systems are the fastest developing applicable materials in the field of gas adsorption and separation, catalysis, clean energy technology, magnetism, drug delivery, proton conductance, sensing, and electronic and electrical device fabrication.[11−21] In the last few decades, mixed ligand systems have been extensively used for the fabrication of structurally diverse molecular systems.[22−25] Suitable ideas and scientific logic are being dedicated to engineer and characterize these crystalline materials. One of the strategies for constructing such materials is to utilize secondary interactions for the fabrication of higher dimensional supramolecular assembly, which are completely different in nature and more efficient. In this regard, hydrogen bonding, π···π, C−H···π, cation···π, anion···π, halogen···halogen, halogen···π, and van der Waals interactions play the pivotal role.[26−29] Cd(II) metal ions based CPs and CNs are extensively used for a wide variety of structures and potential applications due to their d^{10} configuration and borderline nature with respect to the hard soft acid base (HSAB) concept.[30]

However, the construction of suitable electronic and electrical devices exploiting these hybrid materials is still a challenging task because of their low conductivity. The lowering the conductivity is accredited to the insulating nature of the long carbon chain based linker and deprived interaction between the d-orbitals of metal and π-orbitals of ligands. Rational design of thermally and chemically stable CPs promotes their electronic applications.[31−33] The control of electrical conductance by controlling the molecular structure or molecular assembly is a key issue in molecular electronics. Interestingly, our group is able to project a number of CPs for

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application in electrical conductivity and device fabrication.[34−39]

On the other hand, the design of chemical sensors and their implementation in the detection of ions or molecules have received active interest from chemistry, physics, chemical engineering, and many other branches of science, technology, and industry. Usually, a chemical sensor is a compound (organic compound or inorganic complex) that is utilized for sensing an analyte to produce a detectable alteration or a signal. The application of such a sensor is known as

conductivity in the semiconducting regime as confirmed by an experimental band gap. Besides, compound
enhancement of conductivity upon light soaki
can be utilized in the fabrication of optoelect
More interestingly, the synthesized material is h
toward detection of sensing epNACs with the m
fluorescence method. Here, the spatial distribut
dangling naphthalene moieties of the 4-nvp ligand is responsible for an affordable interaction with the incoming guest analytes and subsequently sensing NACs.

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Halogen···Halogen and π–Hole Interactions in Supramolecular Aggregates and Electrical Conductivity Properties of Cu(II)-Based 1D Coordination Polymers

Published as part of a Crystal Growth and Design virtual special issue on Emerging Investigators 2022

Sanobar Naaz, Pubali Das, Antonio Frontera, Basudeb Dutta, Samim Khan, Partha Pratim Ray, and Mohammad Hedayetullah Mir*

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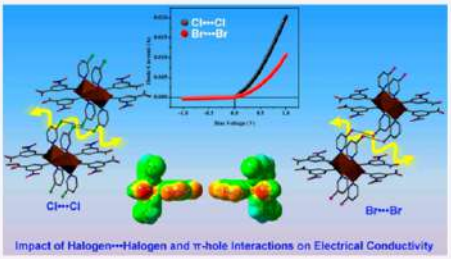
ABSTRACT: The two isostructural one-dimensional coordination polymers (1D CPs) $[Cu(5\text{-nip})(3\text{-Clpy})_2]_n$ (**1**) and $[Cu(5\text{-nip})(3\text{-Brpy})_2]_n$ (**2**) have been synthesized using a 5-nitroisophthalic acid ($H_2$5-nip) linker and the meta-substituted 3-chloropyridine (3-Clpy)/3-bromopyridine (3-Brpy) auxiliary ligands. The structural architectures and supramolecular interactions of the CPs have been investigated by single-crystal X-ray diffraction (SCXRD) and density functional theory (DFT) studies, respectively. The SCXRD study reveals that CPs **1** and **2** form a 1D double-chain structure with carboxylato-bridged cyclic secondary building units (SBUs). Interestingly, both CPs involve type I halogen···halogen (X···X) interactions combined with π···π stacking interactions to generate a three-dimensional (3D) supramolecular network. Moreover, both CPs exhibit interesting X···N π-hole interactions involving a nitro group as the electron acceptor. Both CPs show electrical conductivity in the semiconducting regime and behave as Schottky diodes. However, CP **1** has a higher electrical conductivity in comparison to CP **2**.



INTRODUCTION

In the past few decades, crystal engineering of coordination polymers (CPs) has received enormous attention because of their versatile structural architectures and wide spectrum of applications in diverse fields.[1−10] The construction of CPs is further promising, as these can be tailored by choosing the appropriate metal ions and organic ligands according to the desired structural flexibility and functional properties.[11−16] In this regard, syntheses of CPs based on carboxylato-bridged metal ion clusters acting as secondary building units (SBUs) have also become a field of interest due to the underlying topology.[17−19] SBUs act as nodes and propagate via the linkage of an organic ligand to generate a versatile dimensionality of frameworks. Further, monodentate N-donor pyridyl ligands attached to SBUs are capable of being involved in supramolecular interactions to generate a higher-dimensional structural network depending on the substituents present in the pyridyl ligands.[20−23]

Supramolecular chemistry has recently been explored to introduce several noncovalent interactions in crystalline systems via the practice of crystal engineering.[23,24] Although hydrogen bonding remains the utmost supramolecular force present in most chemical and biological environments,[25] halogen bonding[26] also shares strength and directionality features similar to those of hydrogen bonding. However, a recent search has been going on to comprehend weaker halogen···halogen (X···X) interactions[27] that have prospective future applications in terms of their ability to form highly stable metal complexes as well as tune the biological and conjugated material properties.[28,29] Desiraju and co-workers illustrated two types of X···X interactions (types I and II) on the basis of their directional nature (Scheme S1 in the Supporting Information).[30] The existence of both an electron-rich "belt" and an electropositive σ-hole (Cl, Br) are key aspects in elucidating these types of interactions. In this regard, the interplay of X···X interactions in CPs capable of intriguing structural architectures followed by promising functional applications has not been much explored, although ample

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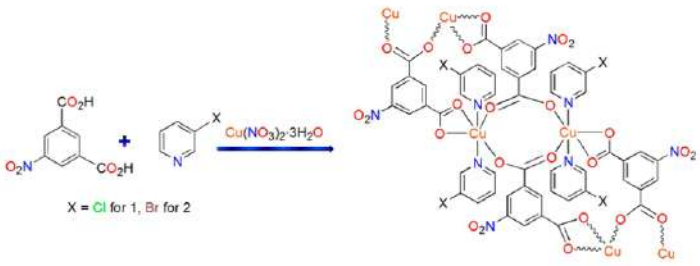
Scheme 1. Schematic View of the Cyclic SBUs in CPs 1 and 2



reports are available with regard to organic crystal engineering based on X···X interactions. However, our group and others have made an effort to explore the role of X···X interactions in crystal engineering and their possible applications.[31−35]

Recently, we have reported a series of Cu(II)-based CPs made up of isophthalate and meta-substituted halopyridine to investigate the effect of X···X interactions in the crystal packing for the formation of the overall topology of the network.[36] In a continuation of this work, we intend to introduce a nitro group by replacing isophthalate with nitroisophthalate, keeping the auxiliary ligand the same, and to check whether any structural diversity coupled with varied applications may emerge.

in 2 mL of EtOH was carefully layered above it. Then the tube was sealed with Parafilm and left standing for slow diffusion at room temperature. After a few days, needle-shaped blue crystals of $[Cu(5\text{-nip})(3\text{-Clpy})_2]_n$ (**1**) were obtained (0.070 g, yield 70%) (CCDC 2150273). Anal. Calcd for $C_{18}H_{11}Cl_2CuN_3O_6$: C, 43.26; H, 2.22; N, 8.41. Found: C, 43.1; H, 2.4; N, 8.2; IR (KBr pellet, cm^{-1}): 1620 ν_{as}(COO), 1338 ν_{sys}(COO).

Synthesis of 2. CP **2** was synthesized by a procedure similar to that adopted for **1** except using 3-bromopyridine (3-Brpy) (0.032 g, 0.2 mmol) instead of 3-chloropyridine (3-Clpy). After a few days, needle-shaped blue crystals of $[Cu(5\text{-nip})(3\text{-Brpy})_2]_n$ (**2**) were obtained (0.080 g, yield 68%) (CCDC 2150274). Anal. Calcd for $C_{18}H_{11}Br_2CuN_3O_6$: C, 36.73; H, 1.88; N, 7.14. Found: C, 36.9; H,

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Photomechanical effect in Zn(II) and Cd(II) 1D coordination polymers: photosalient to non-salient behaviour†

Samim Khan,[a] Sanobar Naaz,[a] Akansha Ekka,[b] Basudeb Dutta,[a] Sourav Roy,[c] Raghavender Medishetty*[b] and Mohammad Hedayetullah Mir*[a]

A Zn(II) based one-dimensional (1D) coordination polymer (CP), [Zn(*cis*-1,4-chdc)(4-nvp)] (1) {*cis*-1,4-H_2chdc = *cis*-1,4-cyclohexanedicarboxylic acid and 4-nvp = 4-(1-naphthylvinyl)pyridine}, undergoes a solid-state photochemical [2+2] cycloaddition reaction, accompanied by mechanical motion, wherein crystals show swelling, jumping, splitting and bursting upon UV irradiation, whereas the analogous Cd(II) CP [Cd(*cis*-1,4-chdc)(4-nvp)] (2) does not show any such response under UV light, although it undergoes [2+2] photodimerization. The present study can certainly provide the fundamental understanding for designing smart photoactuating materials.

Light can cause molecules to move, twist, and bind together. Light induced mechanical responses of crystalline materials are a hot topic due to their potential applications in electrochemical, smart medical and memory devices, artificial muscles, sensors, and probes.[1–5] In the extreme, beyond bending, twisting and swelling, it is "photosalience", where crystals physically burst, scatter or jump, hop, split, curl, swim and eventually are fragmented into pieces uncontrollably because of light irradiation – a phenomenon reported as long ago as 1834 to describe the behavior of α-santonin crystals in sunlight.[6,7] Until recently, reports of photosalient crystals assumed photosalience to be an extremely rare effect, but recent results suggest that it may be much more accessible than previously thought.[8] Literature studies have revealed that dynamic molecular crystals showing photoinduced mechanical motions such as bending, twisting, cracking, jumping, and breaking have been demonstrated *via* isomerization of azobenzenes,[9,10] [4+4] photocyclization and cycloreversion of diarylethenes,[11–13] dimerization of anthracenes,[14,15] and [2+2] photocycloadditions[16–19] by translating nanoscopic structural perturbations at the molecular level to macroscopic crystals in an impressive manner. Photomechanical motions triggered by the [2+2] cycloaddition reaction, where the parallel olefin groups satisfy Schmidt's topochemical criteria,[20] have been studied in organic crystals, metal–organic complexes, and coordination polymers (CPs).[16–19,21,22] This photosalient (PS) effect can propel crystals to travel distances many times more than their own size.[23] The reason for such PS behavior can be assigned to the strain generated in the unit cell due to anisotropic expansion/contraction upon irradiation and structural transformation.

A key design requirement appears to be well-defined anisotropy in photoinduced structural changes. Recent reports using judicious choices of metal ions and linkers have shown that it is possible to fabricate CPs that exhibit the PS effect when excited with UV light or sunlight. Finally, the low density and relative flexibility of metal–organic crystals[24,25] will bypass issues of low photoconversion suffered in close-packed molecular crystals by providing space for photoconversion to occur without losing the development of anisotropic strain required for photosalience. Of the CPs, one-dimensional (1D) CPs are more exciting because sufficiently dramatic photoinduced molecular structure changes can easily be directed to occur specifically in pillar/capping-linkers that have an excellent likelihood of affording the PS effect. The high degree of structure control in 1D CPs is a major advantage over simply crystallising molecular species, and the defined anisotropy will provide targeted directionality to the photoinduced structural changes. In this regard, our group reported the first example of a 1D CP that exhibits the PS effect while releasing an elusive cyclobutane ligand.[26] Recently, Vittal and co-workers have also reported a few Pb(II) based 1D CPs exhibiting the PS effect while undergoing a [2+2] cycloaddition reaction under UV light.[27,28]

In particular, *cis*-1,4-cyclohexanedicarboxylic acid (*cis*-1,4-H_2chdc) would be an interesting flexible ligand that adopts a chair-type backbone and switches between *trans*-1,4-H_2chdc and its isomer *cis*-1,4-H_2chdc. It often displays variable modes of coordination with metal ions and thus becomes a good candidate for making flexible CPs.[29–32] Therefore, the utilization of this flexible dicarboxylate linker and the 4-(1-naphthylvinyl)-pyridine (4-nvp) ligand is an interesting idea to increase the strain tensor required for the PS effect. Here, we report two 1D CPs, namely, [Zn(*cis*-1,4-chdc)(4-nvp)] (**1**) and [Cd(*cis*-1,4-chdc)(4-nvp)] (**2**), that undergo topochemical [2+2] cycloaddition reactions. Fascinatingly, compound **1** undergoes photodimerization under

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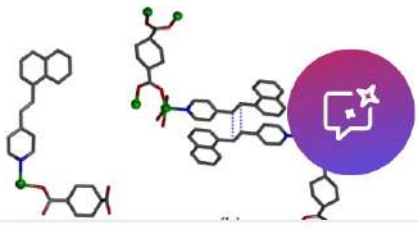
† Electronic supplementary information (ESI) available: Details of the synthesis, elemental analysis, Tables S1–S3, Fig. S1–S16 and X-ray crystallographic data in CIF format. CCDC 2178006 (**1**) and 2178007 (**2**). For ESI and crystallographic data in CIF or other electronic format see DOI: https://doi.org/10.1039/d2cc04135a



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ARTICLE

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Regulating photosalient behavior in dynamic metal-organic crystals

Samim Khan[1], Basudeb Dutta[1], Sanobar Naaz[1], Aditya Choudhury[2], Pierre-Andre Cazade[3,4], Emma Kiely[3], Sarah Guerin[3,4]✉, Raghavender Medishetty[2]✉ & Mohammad Hedayetullah Mir[1]✉

Dynamic photoactuating crystals have become a sensation due to their potential applications in developing smart medical devices, molecular machines, artificial muscles, flexible electronics actuators, probes and microrobots. Here we report the synthesis of two iso-structural metal-organic crystals, $[Zn(4\text{-ohbz})_2(4\text{-nvp})_2]$ (**1**) and $[Cd(4\text{-ohbz})_2(4\text{-nvp})_2]$ (**2**) {H4-ohbz = 4-hydroxy benzoic acid; 4-nvp = 4-(1-naphthylvinyl)pyridine} which undergo topochemical [2 + 2] cycloaddition under UV irradiation as well as sunlight to generate a dimerized product of discrete metal-complex $[Zn(4\text{-ohbz})_2(rctt\text{-4-pncb})]$ {*rctt*-4-pncb = 1,3-bis(4′-pyridyl)-2,4-bis(naphthyl)cyclobutane} (**1′**) and one-dimensional coordination polymer (1D CP) $[Cd(4\text{-ohbz})_2(rctt\text{-4-pncb})]$ (**2′**) respectively, in a single-crystal-to-single-crystal (SCSC) process. The Zn-based compound demonstrates photosalient behaviour, wherein crystals show jumping, splitting, rolling, and swelling upon UV irradiation. However, the Cd-based crystals do not show such behaviour maintaining the initial supramolecular packing and space group. Thus the photomechanical behaviour can be induced by choosing a suitable metal ion. The above findings are thoroughly validated by quantitative density functional theory (DFT) calculations which show that the Zn-based crystal shifts towards an orthorhombic structure to resolve the anisotropic UV-induced mechanical strain. Furthermore, the mechano-structure-property relationship has been established by complimentary nanoindentation measurements, which are in-line with the DFT-predicted single crystal values.

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Evolution occurs due to the phenomenon known as natural selection, where organisms adapt and change to survive in their environment. Natural selection is based on the idea of "survival of the fittest", where the most adaptive organisms will gradually change or evolve as the environmental changes via locomotion[1]. Animal locomotion is seemingly autonomous, e.g. walking, running, swimming, jumping, hopping, flying, soaring and gliding. In the case of plants, a variety of mechanisms are employed in order to achieve their fast movements, e.g. the fast closing trap (100 ms) of the venus flytrap[2] or the opening of petals of the dogwood bunchberry's flower (0.5 ms). Some plants are able to move their leaves very rapidly in response to mechanical stimuli[3], with many plants spreading their seeds or pollen by rapid movement. Cardamine hirsuta has seed pods which explode on touching. Some beans twist as they dry out, putting tension on the seam, which at some point will split suddenly and violently flying the seeds meters from the maternal plant[4].

polymer (1D CP) $[Cd(4\text{-ohbz})_2(rctt\text{-4-pncb})]$ (**2′**) via a SCSC process respectively. Interestingly, during this photoreaction, the Zn-complex **1** shows mechanical motion such as swelling, splitting, jumping and scattering. However, after the photomechanical effect is induced, these PS crystals uniquely maintain their single crystallinity nature and allow for single crystal structural elucidation. This is a rare example of a metal-complex that exhibits a single crystal structure even after PS effect. The Cd(II)-based crystal **2** does not d… tains its single c… crystals of [Zn… tion mixture f… isomer of **1**. In… thus are found… has been previou… relationship for the PS effect in crystals. Meanwhile, the PS effect of metal-complex is seldom explained by experimental and theoretical predictions. Here, we predominantly use density func-

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Topochemical [2 + 2] Cycloaddition in a Two-Dimensional Metal–Organic Framework via SCSC Transformation Impacts Halogen···Halogen Interactions

Samim Khan, Antonio Frontera,* Ryotaro Matsuda,* Susumu Kitagawa,* and Mohammad Hedayetullah Mir*

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ABSTRACT: A photoactive two-dimensional metal−organic framework (2D MOF) $[Zn(4\text{-spy})(DCTP)]_n$ (**1**) [where 4-spy = 4-styrylpyridine and H_2DCTP = 2,5-dichloroterephthalic acid] undergoes photochemical [2 + 2] cycloaddition on UV irradiation to obtain three-dimensional (3D) MOF $[Zn(rctt\text{-}4\text{-ppcb})(DCTP)]_n$ (**2**) [*rctt*-4-ppcb = 1,3-bis(4′-pyridyl)-2,4-bis(phenyl)cyclobutane] in a single-crystal to single-crystal (SCSC) manner. This structural transformation leads to stronger halogen···halogen interaction that is well-corroborated by density functional theory (DFT) calculations.

Metal−organic framework (MOFs) have been one of the most highly regarded solid-state hybrid materials and taken huge interest among material synthetic chemists, because of their myriad of applications.[1−7] The fascinating aspect of MOFs is that we can functionalize them to fine-tune their physical properties and reactivity according to our desire. Recently, solid-state structural transformation (solvent-free) of MOFs has engrossed much attention.[8−13] In this regard, topochemical [2 + 2] cycloaddition is particularly appealing to obtain stereoselective cyclobutane ring in photoactive MOFs to alter their physiochemical properties and is relatively less explored.[14−23] Nowadays, the research phase is being shifted from discovery of phenomena to control structural transformation. In this regard, single-crystal to single-crystal (SCSC) transformation of MOFs is rare and most exciting, because it gives exact structural insights into the transformed structures (changes in molecular geometry and/or intermolecular interaction) with no cracks and breaks in the crystal and creates the possibility to afford unexplored new functions.[24]

Of these, light-induced SCSC transformation has garnered special interest, because of its potential applications in preparing photoswitching devices, smart medical devices, artificial muscles, flexible electronics, and probes.[25−31] However, the photoreaction may not fully happen in an entire crystal, because of the high absorbance of molecules in crystal or side reactions. Therefore, it is both promising and challenging to develop photoactive MOFs that undergo SCSC transformation with diverse applications. To achieve SCSC transformations, precautions to withstand the crystallinity of the materials are needed. One of the possible ways is to irradiate the crystal on the goniometer itself at low temperature.[9] Recently, we have also reported several MOFs that undergo SCSC transformations along with applications in electrical conductivity, gas adsorption, sensing, and photoactuators.[32−37] However, impact on halogen−halogen (X···X) interactions via SCSC transformation of MOFs have rarely been explored. The recent search is going on to comprehend weaker X···X interactions that have prospective future applications in terms of their ability to form highly stable metal complexes, as well as tuning biological and conjugated material properties.[38,39]

Herein, we have designed an interdigitated two-dimensional (2D) MOF $[Zn(4\text{-spy})(DCTP)]_n$ (**1**) [where 4-spy = 4-styrylpyridine and H_2DCTP = 2,5-dichloroterephthalic acid] that undergoes topochemical [2 + 2] cycloaddition reaction under UV light and generates three-dimensional (3D) MOF $[Zn(rctt\text{-}4\text{-ppcb})(DCTP)]_n$ (**2**) [where *rctt*-4-ppcb = 1,3-bis(4′-pyridyl)-2,4-bis(phenyl)cyclobutane] via SCSC transformation. Interestingly, this photochemical structural change has significant impact on the quasi-type I/type II X···X interactions.[40] Compound **2** exhibits relatively stronger Cl···Cl interactions, as compared to **1**, which is well supported by the DFT study. As far as our knowledge extends, this is the first study reporting a MOF exhibiting noncovalent X···X interactions that strengthen upon the post-synthetic modification (PSM) via [2 + 2] cycloaddition.

The colorless block-shaped single crystals were grown in the narrow-necked (67% yield) tube by slow diffusion of 4-spy and H_2DCTP (deprotonated by Et_3N) in ethanol into a solution of aqueous $Zn(NO_3)_2{\cdot}6H_2O$. Single-crystal X-ray diffraction (SCXRD) at 113 K reveals that the compound **1** crystallizes in the triclinic crystal system with space group $P\bar{1}$ and $Z = 2$. Each Zn(II) center is coordinated to four O atoms of DCTP ligands forming an equatorial plane and one N atom of 4-spy at

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an axial position to obtain a distorted square-pyramidal geometry. Each Zn(II) center is further bridged by four DCTP ligands to another Zn(II) ion forming a basic dimeric unit (Figure S1a in the Supporting Information) that is typical of well-known $[Cu_2(O_2CCH_3)_4]$ paddle-wheel structure.

Each dimeric paddle wheel unit propagates to form a one-dimensional (1D) chain and a linkage of this chain further propagates in the perpendicular position to obtain a square grid 2D MOF (see Figure S1b in the Supporting Information). The dimensions of side lengths of the square are 10.95 and 10.89 Å and angles are 89.58° and 90.42°. Thus, a large cavity is created that is susceptible to interpenetration. However, the presence of long 4-spy at the node of the square grid hinders interpenetration and causes interdigitation of 4-spy ligand to maximize the utility of empty space. The hydrogen atom H19A, connected to the carbon atom C19, of a phenyl group of 4-spy is involved in C−H···π interactions at a distance 3.93 Å with the phenyl group of DCTP ligand of above layer. The same phenyl group of 4-spy ligand is also involved in π···π stacking interactions with an interpenetrated phenyl group of DCTP (Figure S2a in the Supporting Information) leading to a 3D supramolecular assembly (Figure S2b in the Supporting Information). The Cl atoms in DCTP ligand involve very weak Cl···Cl interactions (3.68 Å). These noncovalent interactions lead to the stacking of 4-spy ligands from adjacent layers in head-to-tail fashion (Figure S3 in the Supporting Information). The C═C bonds distance between two such aligned 4-spy is 3.84 Å, which satisfies Schimdt's criteria (<4.2 Å) for [2 + 2] photocycloaddition reaction in the solid state (Figure 1).[41,42] This motivated us to perform [2 + 2] cycloaddition of interdigitated 2D layers into 3D interpenetrated structure (Figure S4 in the Supporting Information).

two Zn(II) centers connected by aligned 4-spy (17.03 Å in **1** to 14.07 Å in **2**). Consequently, the noncovalent interactions involved at **1** were also altered. The distance between Cl···Cl contact shortens from 3.68 Å in **1** to 3.53 Å in **2**, likely leading to stronger Cl···Cl interactions. This persuaded us to investigate Cl···Cl interactions in both compounds further in detail via DFT study. The geometric features of the C−Cl···Cl−C contacts suggest that they can be considered as halogen bonds (Figure S9 in the Supporting Information). In order to rationalize the Cl···Cl interaction, we have generated the molecular electrostatic potential (MEP) surface of the H_2DCTP ligand to investigate the degree of anisotropy at the Cl atom. Figure 2 shows the MEP surface, where the

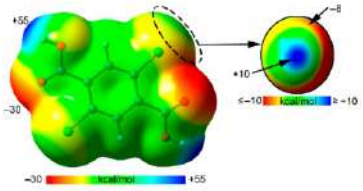

Figure 2. MEP surface of H_2DCTP. Isosurface 0.001 au The energies at selected points are given in kcal/mol.

maximum and minimum MEP values are located at the carboxylic H and O atoms (+55 and −30 kcal/mol, respectively). We have also represented the MEP surface at the Cl-atom using a reduced scale (±10 kcal/mol), thus

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Cu(II)-Based Molecular Hexagons Forming Honeycomb-like Networks Exhibit High Electrical Conductivity

Sanobar Naaz, Pubali Das, Samim Khan, Basudeb Dutta, Sourav Roy, Antonio Frontera,* Partha Pratim Ray,* and Mohammad Hedayetullah Mir*

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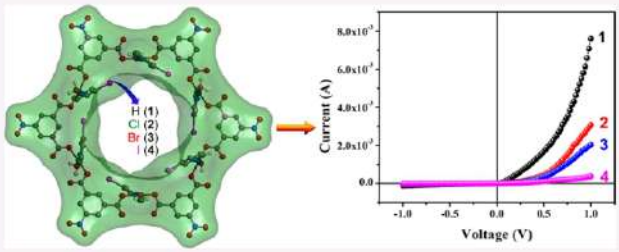

ABSTRACT: Four new Cu(II)-based hexagonal complexes with the metallomacrocycle formulae $[Cu_6(5\text{-nip})_6(3\text{-py})_6(H_2O)_{12}]$ (**1**), $[Cu_6(5\text{-nip})_6(3\text{-Clpy})_6(H_2O)_{12}]$ (**2**), $[Cu_6(5\text{-nip})_6(3\text{-Brpy})_6(H_2O)_{12}]$ (**3**), and $[Cu_6(5\text{-nip})_6(3\text{-Ipy})_6(H_2O)_{12}]$ (**4**) have been synthesized using 5-nitroisophthalic acid ($H_2$5-nip) and pyridine (py)/3-halopyridine (3-Xpy; X = Cl, Br, and I) ligands. The structural features and supramolecular interactions of compounds **1**−**4** have been investigated using the single-crystal X-ray diffraction (SCXRD) technique. Interestingly, the hexagonal complexes undergo hydrogen bonding and $\pi\cdots\pi$ stacking interactions to form fascinating two-dimensional (2D) honeycomb-like structures. The synthesized complexes exhibit high electrical conductivity, arising from charge transport through space via $\pi\cdots\pi$ contacts. However, complexes containing 3-Brpy (**3**) and 3-Ipy (**4**) exhibit photosensitivity due to the presence of halogens with a larger size and lower ionization energy. The conductivity results are also in accordance with the theoretical prediction calculated by density functional theory (DFT) study.

INTRODUCTION

Design and research of transition metal complexes have attracted increasing attention in recent years because of their essential roles in catalysis, materials chemistry, photophysics, and bioinorganic chemistry.[1−6] Understanding of metal complexes originated from the pioneer discovery of Alfred Werner regarding the spatial arrangement of metal complexes, which is directly related to their observed properties. Although a duration of more than a century is over, the crystal engineering of metal complexes is still continuing to undergo rapid expansion.[7−11] However, metal complexes have the possibility of involving supramolecular interactions to generate infinite one-dimensional (1D), two-dimensional (2D), or three-dimensional (3D) network structures.[12−15] These interactions include hydrogen bonding, halogen bonding, and $\pi\cdots\pi$ and C−H$\cdots\pi$ interactions.[16−20] The most popular and successful approaches to fabricate supramolecular aggregates are using hydrogen bonding and $\pi\cdots\pi$ stacking interactions.[18,19] Organic ligands with an extended π-functionality have additional sites for interacting with π-ligands in an array.[21,22]

Depending upon the nature of the metal ions and the shape of the ligands, metal complexes adopt versatile coordination and spatial display.[23−26] In this regard, the angular ligand 1,3-benzenedicarboxylic or isophthalic acid (H_2ip) is often used in the preparation of coordination polymers or discrete metal−organic complexes or polyhedra.[27−30] Additionally, subtle variation in the ligand structure may have a huge impact on the structural architecture of the framework topology. For example, introduction of the $-NO_2$ group in H_2ip, i.e., 5-nitroisophthalic acid ($H_2$5-nip), has been proven to contribute to the structural variation from the polymeric motif to the discrete macrocyclic ring.[31] Recently, we have published a series of Cu(II)-based coordination polymers using a H_2ip and

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pyridine (py)/3-halopyridine (3-Xpy; X = H, Cl, Br, and I) mixed-ligand system.[32] However, we sought to investigate the consequence of introducing a substituent in the carboxylate backbone. With this intention, we wanted to replace H_2ip with $H_2$5-nip and investigate the compounds obtained by the reaction with Cu(II) and 3-Xpy. In this regard, very recently, we have reported two Cu(II)-based 1D coordination polymers using 5-H_2nip and 3-Xpy (X = Cl and Br) by a reverse layering

illumination, i.e., photosensitivity due to the halogen with a larger size and lower ionizat

EXPERIMENTAL SECTION

Materials and Methods. All the starting were purchased as reagent grade and were utilized without further purification. Elemental analyses (carbon, hydrogen, and nitrogen) were performed on a Perkin-Elmer 240C elemental analyzer. Infrared

A Lacanian Psychoanalysis of Gillian Flynn's Amy Elliott Dunne of *Gone Girl*

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Abstract:

Gone Girl is a crime fiction by the American author Gillian Flynn which provides a psychological insight into the mind and motive of the central character, Amy Elliott Dunne. The novel starts with Nick, the husband coming under police scrutiny as his wife Amy, goes missing on the very day of their fifth marriage anniversary. However, as the case gradually unfolds, the scenario turns out to be far more complex than it appears at first glance. The character of Amy is intricately complex and multi-layered, tending towards the necessary evil and yet with a humane touch. Amy Dunne plays both the victim and the victimizer.She comes across as a strong yet fragile character, a vindictive and powerful person at the same time. A close reading and psychoanalysis of the character of Amy, shows that her actions and behavioral patterns are a reflection of her ingrained identity formation. Her survival instinct is based on extremes. It is the deep-seated childhood trauma and marital issues with an adulterous husband, that Amy dons the multiple personality traits and embarks on becoming the manipulative female fatale, one who attempts at the absolute dissolution of the patriarchal structure.This paper intends to study the psyche behind the actions and behavioralpatterns of Amy Dunne, the woman protagonist in Flynn's *Gone Girl*, with reference to Lacan's three stages of identity formation.

Keywords: Psychoanalysis, Identity formation, Woman protagonist, Role-play, Conflicts

Gillian Flynn's one of the most acclaimed novels, *Gone Girl* belongs to the crime and detective fiction genre. In this novel, Flynn presents Amy Elliott Dunne, the protagonist as a grey character tending towards the necessary evil more. The central theme of this intriguing novel is whether the husband, Nick Dunne, is involved in the mysterious disappearance of Amy, the wife; on the day of their fifth wedding anniversary. Flynn here presents an interesting technique of storytelling, the narrative continuously oscillates between the present and the past, the present day is narrated by Nick, as things gradually proceed and the past comes alive from the diary recordings of Amy, however, both Nick and Amy are later found to be unreliable narrators. The underlying tension in their conjugal life is well depicted in the first chapter itself which commences with Nick Dunne reflecting upon his present situation:

> When I think of my wife, I always think of her head...What are you thinking, Amy?The question I've asked most often during our marriage, if not loud...What are you thinking? How are you feeling? Who are you? What have we done to each other? What will we do? (Flynn3).

Thus, the very first self-introspective thought on the part of Nick reveals an almost broken marriage and the economic recessiononly made the situation worse for them. Nick decided to go back to their hometown Missouri, where his family lived, the father was suffering from Alzheimer and now the mother was battling cancer. Amy,without any choice had to followher husband. There Nick and Margo jointly started a bar, borrowing Amy's money, which he vowed to return to his wife along with the interest andkept reminding himself:

I would not be a man who borrowed from his

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Art Therapy: A Healing Tool in Health Care

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ABSTRACT

In 1942, British artist Adrian Hill discovered the benefits of painting and drawing while recovering from tuberculosis. In the mid-20th century, art therapy was broadly accepted publicly as a therapeutic approach. Art therapy is a kind of therapy done under the guidance of a trained professional to relax or practice self-care by being creative. It can be beneficial to an individual or group in any sort of setting, be it hospitals, communities, home settings, or even school. This therapeutic process can be effective for a range of physical or mental health conditions, including specific health problems with ongoing daily challenges, and helps clients to live a better quality of life. Art therapy improves mood and reduces pain and anxiety when offered at the bedside during acute hospital treatment. Art therapy may be excellent for all patients, regardless of sex, gender, age, ethnicity, and diagnosis. The significant role of nurses is to implement different forms of art therapy on a daily basis, including the development of policies, as these interventions are often less expensive and easier to implement. Researchers want to do a systematic review and establish hospital protocols on art therapy for inpatient departments of hospitals. While providing mainstream treatments, hospital authorities and health care professionals can use forms of art therapy to optimize care and outcomes.

Keywords: *Art Therapy, Healing Tool, Health Care, Mental Health, Nursing*

Introduction

Art therapy is an expression of the soul of a human being. Children are considered to have the purest souls, and they love to explore new ideas. These qualities of mind encourage researchers to work in this field.

A systematic review of art therapy sheds light on its benefits and effectiveness for mental and physical well-being.

Modern art therapy focuses on the creation of images or objects that enrich the personality. The art therapist and client establish a psychotherapeutic relationship through self-expression and reflection. Aesthetic outcomes are not expected outcomes of art therapy (Holttum, 2020). Art therapy mostly focuses on the thought process and feelings of the client through the process of creation.

The goal of therapeutic interventions is highly individual and parallel to the

developmental needs of children (Rubin, 2005).

Education and the learning process are the integrated approach to art therapy, which helps children gain confidence in their expression of feelings and increase their self-esteem.

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Review Article

Role of nursing professionals in making hospital stay effective and less stressful for patients with ASD: A brief overview

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Abstract

The hospital may be especially overwhelming to patients with Autism Spectrum Disorder (ASD) and their families. The characteristics and attributes inherently present in patients with ASD provide substantial challenges to nursing care if not recognized, identified and addressed. ASD is a complex disorder and requires preparation, education, and great assessment skills from the nurses for optimal outcomes. Nurses are often the front-line and direct care providers and need to attain the knowledge and skills necessary to understand, interact with and implement excellent care for these individuals. These patients with ASD can present with a range of social and behavioral challenges including difficulty with communication need for structure, and possible aggression and it is difficult to implement care at times. Nowadays the nursing professionals are being increasingly aware of their role in helping to ensure that patients with ASD receive the best possible care. These patients may have difficulty communicating or may find a break in their routine stressful. By understanding ASD-related challenges and devising ways to make patients as well as their parents or caregivers more comfortable, nurses can make a hospital stay, doctor visit or dental checkup less stressful and more effective. Outcomes improve dramatically when health care professionals obtain the education, expertise, and knowledge necessary to provide such care. In this paper we discuss the common challenges that the nursing staff face while dealing with patients with ASD as well as the difficulties families face. Emphasis will be on the role of nursing professionals in making hospital stay less stressful for individuals with ASD.

Keywords: *ASD, nursing professionals, challenges, hospital stay.*

Introduction

Medical experiences can provoke anxious feelings in children who are typically-developing but individuals with Autism Spectrum Disorder (ASD) face additional challenges, such as difficulty with sensory integration, transitions, flexibility, and communication within their medical experiences (Scarpinato *et al*, 2010). Though recent research has revealed several aspects of autism, several studies have shown that the care and management of people with ASD remains challenging for doctors, nurse practitioners, registered nurses, and other healthcare providers (Cheak-Zamora & Teti, 2015; Chiri & Warfield, 2012).

ASD is a developmental disorder that affects behavior and communication according to Diagnostic and Statistical Manual of Mental Disorders. 5th ed. (APA, 2013). Autism is gastrointestinal issues, eczema, allergies, asthma, ear and respiratory infections, seizures, and migraines. A large percentage of youth with ASD have medical comorbidities

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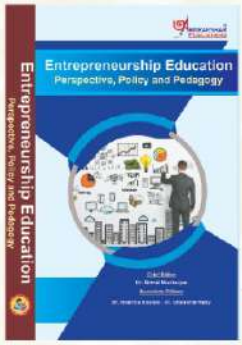

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Certificate of Publication

Smart City Emergence
Cases From Around the World
2019, Pages 261-282

12 - The smart city of Pune

Zeenat Rehena [1], Marijn Janssen [2]

https://doi.org/10.1016/B978-0-12-816169-2.00012-2 | Get rights and content

Abstract

Global urbanization trends and pressing issues around sustainability pose great challenges for cities. The smart city concept has been developed as a strategy for dealing with sustainability challenges by collecting data and connecting systems and increasingly relying on the use of information and communication technology to meet the needs of their citizens. India has recently committed to the

An Approach for Adaptive Traffic Light Control System in ITS using VANET

Publisher: IEEE

Cite This | PDF

Md. Mazaherul Islam ; Zeenat Rehena ; Nandini Mukherjee All Authors

Abstract:
Traffic congestion is a common problem in everyday's life as number of vehicles is increasing day by day on the road. So, traditional road traffic control system needs to be updated accordingly. An adaptive traffic light control system can solve the traffic congestion problem efficiently. Vehicular Adhoc Network (VANET) is a common and useful application for designing an adaptive traffic light control system as a part of Intelligent Transportation System (ITS). This paper presents a literature review work on different types of traffic control systems and proposes a method for designing an adaptive traffic light control system using VANET

Finding Optimal Routes in MaaS Framework using ParetoBFS

Publisher: IEEE

Poojarini Mitra ; Zeenat Rehena ; Nandini Mukherjee **All Authors**

Abstract:

To offer Mobility as a Service (MaaS) to the consumers while handling time-dependent multi-modal transportation and maintaining multiple criteria is a complex task. The system needs to be intelligent enough to provide optimal routes within the least possible computation time. This paper proposes a simple method that seeks to provide a solution by using the ParetoBFS algorithm, a modified version of the traditional BFS algorithm, which uses Pareto constraints to prune the graph and find all Pareto-optimal paths in a network considering multiple criteria. Evaluations with different scenarios were performed using the proposed mechanism and its performance was compared with Weighted-Sum Dijkstra's Algorithm. It can be observed that the proposed mechanism is achieving better results than Weighted-Sum Dijkstra's Algorithm.

Challenges of Handling Data in IoT-Enabled Healthcare

Chapter | First Online: 19 July 2022
pp 101–118 | Cite this chapter

Internet of Things Based Smart Healthcare

Zeenat Rehena & Nandini Mukherjee

Part of the book series: Smart Computing and Intelligence ((SMCOMINT))

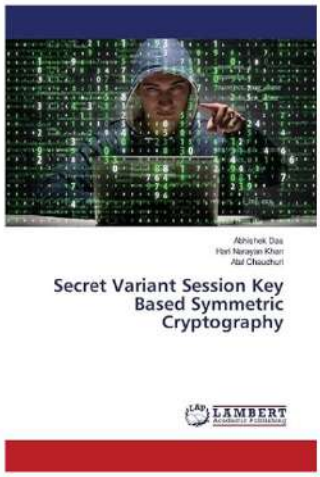
Abstract

Time Series Forecasting using Deep Learning Paperback – May 15, 2020

by Abhishek Das (Author), Samit Bhanja (Author)

1.5 ★★☆☆☆☆ 2 ratings

Deep Learning which comprises Deep Neural Networks (DNNs) has achieved excellent success in image classification, speech recognition, etc. But DNNs suffer a lot of challenges for time series forecasting (TSF) because most of the time-series data are nonlinear in nature and highly dynamic in behavior. TSF has a great impact on our socio-economic environment. Hence, to deal with these challenges the DNN model needs to be redefined, and keeping this in mind, data pre-processing, network architecture and network parameters are needed to be considered before feeding the data into DNN models. Data normalization is the basic data pre-processing technique form which learning is to be done. The effectiveness of TSF heavily depends on the data normalization technique. In this Book, different normalization methods are used on time series data before feeding the data into the DNN model and we try to find out the impact of each normalization technique on DNN for TSF. We also propose the Deep Recurrent Neural Network (DRNN) to predict the closing index of the Bombay Stock Exchange (BSE) and the New York Stock Exchange (NYSE) by using time series data.



Secret Variant Session Key Based Symmetric Cryptography Paperback – December 13, 2018

by Abhishek Das (Author), Hari Narayan Khan (Author), Atal Chaudhuri (Author)

Whenever any data exchange transpires through internet, the basic thing that comes to mind is secure communication. The successful and protected communication of any private data is the primary concern of almost all fields. Each and every one desire secured environment to communicate with the authentic beneficiary more willingly than an adversary. Session key based encryption technique helps to meet that precise goal where exchange of key is mandatory before every communication. General explanation is, the new session key be the function of the previous both key and data. So, after every session one needs to extract the next session key and to remember till the next session. In this Book, we have proposed an encryption technique using secret variant session key which is actually constructed from the original user key and the present secret data to be sent by the sender. But our proposed scheme does not require extracting and remembering of session key to construct next session key although the session key changes in every session. We have also introduced two layers of encryption technique which is more robust to defend against any crypto-attack.

RURAL SOCIETY
https://doi.org/10.1080/10371656.2019.1572310

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The role of independent retailers in sustaining rural society: a study in rural India

Dev Narayan Sarkar[a] and Kaushik Kundu[b]

[a]Sales, PepsiCo India, Kolkata, India; [b]Department of Management and Business Administration, Aliah University, Kolkata, India

ABSTRACT

Retailing is the largest non-farm occupation in rural India. Unorganised retailers provide support for rural socioeconomic life by disseminating information, ensuring availability of goods/services, providing credit to villagers, and allowing barter systems in India. These indicate the embeddedness of unorganised retailers in India's rural societies. Store premises in villages are the hubs of social interactions, yet chain stores are not seen to enable such benefits for villages. Hypotheses about the importance of rural retailer independents are developed in light of existing literature. This article presents findings from a survey constructed to research independent retailers by collecting a stratified random sample of villagers in the state of West Bengal, India. Survey responses were subjected to an exploratory factor analysis (EFA) to determine latent constructs. Seven identified constructs were confirmed using confirmatory factor analysis (CFA). Structural equation modelling (SEM) helped determine the relationships of six antecedent factors with the resultant factor, namely, the need for preservation, and the sustainability of rural independents discussed.

KEYWORDS

Management; sustainability; retailing; rural livelihoods; economic embeddedness

Introduction

Rural unorganised retailers are an important final link for making goods and services available to villagers in India (Sarkar & Kundu, 2016), serving as friends, micro-creditors, and advisors to villagers and are not substitutable by retail chains (Modi, 2010). Rural unorganised retailers fulfil many social and economic necessities of villagers, serving as rural community centres and providing respectable self-employment to the shopkeepers (Berdegué, Reardon, Escobar, & Echeverría, 2000; Peattie & Peattie, 2009). Rural unorganised retailers, henceforth termed "rural independents," may generally be delimited using four characteristics: a single individual performs most of the retail functions, they are one-store operations, tend to be under-capitalised, and the basic business objectives are based on survival (Davis, Hills, & LaForge, 1985).

Being an agrarian economy predominantly based on monsoon seasons, the income cycles of rural consumers tend to be seasonal and related to agricultural harvest cycles (Bhattacharya & Innes, 2013). Most villagers use their available cash to purchase agricultural inputs and paying daily wages to farm labourers. Historically, in between harvest

CONTACT Dev Narayan Sarkar devnarayan.sarkar@pepsico.com

ASIAN CASE RESEARCH JOURNAL, VOL. 23, ISSUE 2, 457–489 (2019)

ACRJ

Safed Detergent Powder: Regional Brand with Rural Focus

This case was prepared by Dev Narayan Sarkar, Director of PepsiCo India and Associate Professor Kaushik Kundu of Aliah University, India, as a basis for classroom discussion rather than to illustrate either effective or ineffective handling of an administrative or business situation.

Please send all correspondence to Associate Professor Kaushik Kundu, Department of Management and Business Administration, Aliah University, Kolkata, West Bengal 700156, India. E-mail: kau_kun@rediffmail.com

INTRODUCTION

It was the evening of January 1, 2013 and Mr. Ramesh Lalwani, newly appointed as General Manager, Marketing & Strategy, for Safechem Ltd. was peering anxiously at his laptop in his office on the third floor of his office at 17 Crooked Lane in Kolkata, India. An hour ago, he had refused to order lunch since his worries had killed his appetite. His presentation to the Chief Executive was slated for the very next day. He was going to propose an ambitious growth plan for Safed detergent that evening to Mr. Vinod Jain, Chief Executive and sole proprietor of Safechem Industries. Safechem was focused more on rural markets in Eastern India at that time and Mr. Lalwani's plan was to ramp up the distribution network in the urban centers of East India and penetrate rural markets in other parts of the country. Safed, had 35% market share in eastern India[1], and presence in Bihar, Orissa, Assam, Andhra Pradesh and Tamil Nadu. The market share of Safechem, in the detergents market, in rural east India was 40% and that in urban east India was 30%[2]. Moreover, organic growth was slowing down, with the existing markets yielding a low 8% to 9% growth in 2011–12 owing to resurging competition. It seemed imperative to expand to new geographies to keep up healthy growths through inorganic expansion.[3]

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Research Article

Agri-input Buying Behaviour of Paddy Farmers: A Study in the Context of the New Normal Due to COVID-19

Vision
1–9


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Ferman Haider Haidery[1], Kaushik Kundu[2] and Dev Narayan Sarkar[3]

Abstract

Humanity has witnessed diseases and illnesses since the ancient days. These diseases and illnesses resulted in days of suffering leading to disabilities or deaths of many people within communities and are termed as epidemics. As the society progressed, widespread trade increased the interactions between human, animals and ecosystems, thereby increasing the occurrence of these epidemics, often named as pandemics. Several pandemics have afflicted the world throughout history, be it malaria, tuberculosis, leprosy, influenza, smallpox, plagues or HIV/AIDS or the recent incidence of Novel Coronavirus.

Diseases affect the supply chain of farm produce and agriculture. Consequently, it may impact food security. It is assumed that pandemic affects the buying behaviour of farmers and it has the capacity to alter the buying behaviour of paddy farmers in India. In this study, an attempt is made to investigate the effect of certain factors on farmers purchase behaviour during pandemic situation among rice farmers in Chhattisgarh, India. The studied sample included 120 farmers in Dhamtari, Raipur, India, selected randomly. Narratives were collected from the farmers and were analysed using qualitative data analysis software. From the qualitative data analysis, the implication for marketers is that itinerant trainers should be sent to villages to train the farmers, especially the bigger farmers (who have secondary influence), on the new technologies in agricultural inputs. The farmers also influence each other, and some amount of training coverage may eventually reach all farmers. The local dealers and the village headmen should also be influenced. An attempt should be made to marry the new technologies with the traditional methods, as much as possible.

Key Words

Pandemic, Agriculture, COVID-19, Global Food Security, Paddy, Purchase Behaviour, Qualitative Data Analysis

Introduction

Food security is becoming a more pressing worldwide concern (Mok et al., 2020). Rapid urbanization and industrialization, for example, have put a demand on scarce resources like land and water (Mok et al., 2020). According to new research (Boliko, 2019), the number of hungry individuals on the planet is increasing. High exposure and vulnerability to climatic extremes, conflicts and economic downturn are the three primary causes of food insecurity (Boliko, 2019). Drought is wreaking havoc on world agriculture, causing food security issues in many nations, particularly in the poor world (Kogan et al., 2019). In all, two billion people are projected to be food insecure (they do not have regular access to safe, nutritious and adequate food)—either because they are hungry or impacted by moderate levels of food insecurity (Egal, 2019). It follows that the world had been reeling from food insecurity irrespective of the new normal situation brought on by the COVID-19 pandemic.

The COVID-19 pandemic has brought in new norms like social distancing, online purchases, etc., which is named, 'the new normal' (Vieira de Jesus et al., 2020).

Pandemic-led challenges may lead to aggravation in food insecurity (Laborde et al., 2020). Such food insecurity may lead to penury and destituteness. If policy supports are not forthcoming, food insecurity may lead to a brake in the development journey of any region. With the widespread effect of the pandemic, the world itself may dial back a few

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REVIEW ARTICLE

Dynamics of Decision-Making in Medical Pluralism: A Systematic Review of Conceptual Models

Praheli Dhar Chowdhuri, MPhil; Kaushik Kundu, PhD; Suman Meyur, MBBS, MD, MRSPH (UK)

ABSTRACT

Purpose • Plurality of treatment choice is often observed, as in many instances people choose to use both conventional and complementary and alternative medicine (CAM). The existing models of healthcare utilization or healthcare behavior do not specifically address this medical pluralism. Hence, to understand an individual's pluralistic choice of treatment, major studies describing this have been systematically reviewed in this study in order to extract the principal factors driving such choice. Also, applicability of current healthcare models is qualitatively analyzed in order to identify whether they properly explain the factors driving such pluralistic choices.

Methodology • A systemic literature review was performed of 20 studies including 6 National Surveys. The major variables included were prevalence of integrative medicine in the last 12 months, nature of pluralism, major factors driving plurality of choice and the underlying model describing such choices.

Results • Mean usage of plurality was 44.48% (95% CI, 44.12-44.84%). The major drivers of plurality were enabling (access) and cognitive factors, followed by post-decision dissonance, philosophical congruence and social factors. The studies followed several established conceptual models with almost equal distribution. These major factors and the underlying treatment models were significantly dependent upon each other (Fisher's exact test; $P = .025$), but the cognitive and personality factors were found to be significantly exclusive ($t = 2.39$; $P = .017$).

Conclusion • Medical pluralism incorporates a multitude of decision factors, which are separately related to different healthcare-decision models. Among them, personality trait was observed to be an important but neglected component of existing models. From the existing studies, no single pluralism-driven integral model could be established, satisfying all the important conditions of pluralistic choice. (*Altern Ther Health Med.* 2022;28(7):178-183).

Praheli Dhar Chowdhuri, MPhil, PhD Research Scholar**; Kaushik Kundu, PhD,** Professor; Department of Management and Business Administration, Aliah University, Kolkata, West Bengal, India. **Suman Meyur, MBBS, MD, MRSPH (UK),** Sr. Resident**;** West Bengal University of Health Sciences, West Bengal, India.

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INTRODUCTION

In complex societies, where societal factors have an intense effect on cognition regarding an individual's healthcare status, perception of well-being and treatment needs, multiple modalities of healthcare delivery coexist. This has been termed medical pluralism, which includes the essence of both conventional and traditional or alternative medicines.[1] They are often used concurrently in an integrative manner or alternatively at different times or with different disease conditions. Conventional medicine, popularly called allopathy, uses the basic principles of physics, chemistry and biology and uses drugs made of chemical ingredients, radiation and surgery. On the other hand, complementary and alternative medicine (CAM) comprises a varied group of medical treatment modalities, such as Ayurveda, homeopathy, chiropractic, reiki, acupuncture, etc, each based on different treatment principles. There is extensive debate around the definition of CAM, and it is changing over time. Caspi, et al[2] defined it as "a variable set of diagnostic and therapeutic modalities that are considered to be non-conventional." It has also been defined as "any health improving technique outside of the mainstream of conventional medicine."[3]

Siti, et al divides CAM into mind-body medicine, biological-based therapies, manipulative and body-based systems and energy medicine, and whole system approaches

ANNALs, NAGI Volume-XXXVI (No. 1) June 2016, Page 120-152

REGIONAL DISPARITIES IN THE LEVELS OF DEVELOPMENT IN WEST BENGAL: An Inter District Analysis

Md. Mustaquim* and Asif**

Abstract

The present research paper is an attempt to analyse the spatial patterns of regional disparities by different categories, and variations in the levels of overall development among the districts of the state of West Bengal. The entire study is based on secondary sources of data, obtained from Census of India and other statistical records at district level. Some standard statistical techniques are used in the present study. The district has been taken as a smallest unit of the study. The findings of the analysis reflect that the districts with high grade of overall development are scattered over the state, and the areas of low level of overall development are generally depicted in the north Bengal plain region of the study area. It is generally observed that the level of overall development varies considerably across the districts of the state and such disparities are caused by a sort of social and economic factors such as, literacy rate, educational facilities, health care facilities, levels of urbanization, agricultural development, industrial development and other infrastructural facilities etc. The districts in West Bengal are marked with wide disparity in overall development.

Key words: *regional disparities, development, agricultural development, industrial development, educational facilities, urbanization, health care facilities, demographic characteristics.*

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Way to Immersing Handloom Cottage Industry in Ambarrpur Village of Murshidabad District: A Geographical Study

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ABSTRACT

Handloom is an ancient cottage industry. India is well known for cottage industries. it plays a very important role in Indian's economy after agriculture. West Bengal is also rich in tradition of handloom weaving. It is a part of its cultural heritage. The textile products of Bengal are worldwide famous. Handloom weaving is a heredity occupation and the weaving cannot be done by a single man, it requires collective work. Basically three objectives are taken for this study and snowball technique use for selecting the data. Here we have taken 60 respondent of the study area. The present study tries to find out the present situations of the handloom cottage industry in the study area. The entire study is based on primary sources of data which have been collected from the respondent through a survey schedule sample selection is based on snowball sampling technique and total 60 households(respondents) are selected to quantify the present condition of handloom industry in the study area. This village is locally known as "Krikor Para". This area is very famous for towel manufacturing. In recent time people are shifted their occupation, where in past peoples of every age and sex are working in handloom but now maximum young male population are shifted from this and they go outside for earn more. Lack of government support, lack of education and training they abolish day by day.

Keywords: Handloom, Cottage Industry, Tradition, Krikor Para, Textile.

INTRODUCTION:

Handloom industry in India is an ancient cottage industry. The term 'cottage industry' is used when products are manufactured on a small scale. India is well known for its large number of traditional cottage industries (Joy and Kani, 2013). Handlooms are an important craft product and comprise the largest cottage industry of the country (Emmaniel, 2012). The handloom sector plays a very important role in Indian's economy after agriculture handloom sector absorbing a greater number of manpower(Phukan, 2012). As per the Handloom Census Report, 2009-10 conducted by the National Council of Applied Economic Research (NCEAR), In India, there are 43.31 lakh handloom workers in the country, out of which 36.33 lakh workers (84%) stay in rural areas and 6.98(16%) lakh workers stay in urban areas. Most of the adult workers are female (77%) and the number of male workers (23%) is comparatively smaller. As opposed to female workers belonging to rural areas, a relatively higher proportion of male handloom workers are located in urban areas (Dutta, 2015). Handloom Industry is the largest cottage industry of the state providing employment opportunities to a large number of people only next to agriculture (Govt. of West Bengal Directorate of Textiles). In West Bengal, there are 3,07,829 handlooms as per census conducted by the Ministry of Textiles, Govt. of India in 2009-10 giving

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Article

Genomic Marks Associated with Chromatin Compartments in the CTCF, RNAPII Loop and Genomic Windows

Teresa Szczepińska [1,2], Ayatullah Faruk Mollah [1,3] and Dariusz Plewczynski [1,4,*]

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Abstract: The nature of genome organization into two basic structural compartments is as yet undiscovered. However, it has been indicated to be a mechanism of gene expression regulation. Using the classification approach, we ranked genomic marks that hint at compartmentalization. We considered a broad range of marks, including GC content, histone modifications, DNA binding proteins, open chromatin, transcription and genome regulatory segmentation in GM12878 cells. Genomic marks were defined over CTCF or RNAPII loops, which are basic elements of genome 3D structure, and over 100 kb genomic windows. Experiments were carried out to empirically assess the whole set of features, as well as the individual features in classification of loops/windows, into compartment A or B. Using Monte Carlo Feature Selection and Analysis of Variance, we constructed a ranking of feature importance for classification. The best simple indicator of compartmentalization is DNase-seq open chromatin measurement for CTCF loops, H3K4me1 for RNAPII loops and H3K79me2 for genomic windows. Among DNA binding proteins, this is RUNX3 transcription factor for loops and RNAPII for genomic windows. Chromatin state prediction methods that indicate active elements like promoters, enhancers or heterochromatin enhance the prediction of loop segregation into compartments. However, H3K9me3, H4K20me1, H3K27me3 histone modifications and GC content poorly indicate compartments.

Keywords: 3D genome structure; chromatin compartments; epigenetic modifications; open chromatin; H3K4me1; H3K79me2; H3K9me3; H4K20me1; H3K27me3; GC content

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1. Introduction

The genetic information of eukaryotes is stored in a cell nucleus in the form of a nucleoprotein complex of DNA and histones, known as chromatin. A basic aspect of chromatin structure is that each chromosome occupies a discrete volume, forming a "chromosome territory" [1]. Proximity-based ligation techniques coupled with massively parallel sequencing (Hi-C) have provided evidence for topologically associating domains (TADs). A TAD is defined as a region of a chromosome that shares many interactions within it, but significantly fewer interactions with the adjacent and other more distal TADs [2,3]. The concept of TADs that are of a size ~ 1 Mbp is in concordance with microscopic evidence [4]. The Hi-C map of the human genome at a higher, kilo-base resolution reveals the inner structure of TADs [5]. The observed domains ranged in size from 40 kb to 3 Mb (median size 185 kb). Many of them are loops mediated by CCCTC-binding factor (CTCF). In different experiments on the same cell line (GM12878), chromatin interaction analysis by paired-end tag sequencing (ChIA-PET) strategy allowed the comprehensive mapping of higher-order chromosome folding and specific chromatin interactions mediated by CCCTC-binding factor (CTCF) and RNA polymerase II (RNAPII) [6]. CTCF-mediated chromatin contact

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Muslims in Higher Education in India: A Geographical Analysis

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Abstract

Undoubtedly, education is the most important medium by which we can improve the socio-economic conditions of a particular group or community. India is a large country with a population of 1.29 billion as on November 24, 2015. More than 65 per cent of our total population is below the age of 35 years which can be transformed into human resource. Education in general and higher education in particular is the best medium to transform the young people into human resource. According to All India Survey Report on Higher Education (2011-12), Minister of Human Resource Development, Gross Enrolment Ratio (GER) in higher education in India for the year 2012 is 20.80 per cent which is calculated for 18-23 years of age group. GER for male population is 22.1 and for females it is 19.4 per cent. For Scheduled Castes, it is 14.90 per cent for Scheduled Tribes it is 11 per cent and for Muslims it is only 10.50 per cent as compared to the national GER of 20.8 per cent. Though GER in

SUSTAINABLE DEVELOPMENT, ENVIRONMENTAL ISSUES AND SELF-SUSTAINED SOCIETY

(Editors)

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Muslims in Higher Education in India: A Geographical Analysis

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Abstract

Undoubtedly, education is the most important medium by which we can improve the socio-economic conditions of a particular group or community. India is a large country with a population of 1.29 billion as on November 24, 2015. More than 65 per cent of our total population is below the age of 35 years which can be transformed into human resource. Education in general and higher education in particular is the best medium to transform the young people into human resource. According to All India Survey Report on Higher Education (2011-12), Minister of Human Resource Development, Gross Enrolment Ratio (GER) in higher education in India for the year 2012 is 20.80 per cent which is calculated for 18-23 years of age group. GER for male population is 22.1 and for females it is 19.4 per cent. For Scheduled Castes, it is 14.90 per cent for Scheduled Tribes it is 11 per cent and for Muslims it is only 10.50 per cent as compared to the national GER of 20.8 per cent. Though GER in

SUSTAINABLE DEVELOPMENT, ENVIRONMENTAL ISSUES AND SELF-SUSTAINED SOCIETY

(Editors)

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Development of benchmark datasets of multioriented hand gestures for speech and hearing disabled

Soumi Paul[1] · Hayat Nasser[2,3] · Ayatullah Faruk Mollah[4] · Arpan Bhattacharyya[1] · Phuc Ngo[2,3] · Mita Nasipuri[1] · Isabelle Debled-Rennesson[2,3] · Subhadip Basu[1]

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Abstract
Reliable hand gesture recognition is extremely relevant for automatic interpretation of sign languages used by people with hearing and speech disabilities. In this work, we present (i) new benchmark datasets of depth-sensor based, multi-oriented, isolated and static hand gestures of numerals and alphabets following the conventions of American Sign Language (ASL), (ii) an effective strategy for segmentation of hand region from depth data and appropriate preprocessing for feature extraction, and (iii) an effective statistical-geometrical feature set for recognition of multi-oriented hand gestures. Besides setting benchmark performances on the developed datasets, viz. 97.67%, 96.53% and 96.86% on numerals, alphabets and alpha-numerals respectively, the proposed pipeline is also implemented on two related public datasets and is found superior to state-of-the-art methods reported so far.

Keywords Benchmark datasets · Discrete curve · Hand gesture recognition · Microsoft kinect sensor · Polygonal simplification · Sign language · Statistical geometrical features

1 Introduction

In the field of contactless human-computer interaction (HCI), hand gesture recognition has a wide variety of applications. A major area of application is sign language recognition for hearing and speech impaired persons. In the past, many hand gesture recognition algorithms have been proposed. In early works, hand detection mostly relied on vision-based features that are sensitive to variations of skin colors and lighting. A comprehensive review of hand gesture recognition is presented by Mitra et al. [19]. Skin color based model as that of [39] and hand shape based model like that of [38] have also been proposed. For segmenting the region of interest, i.e., the hand portion of an acquired image, some techniques require wearing of an electronic glove as reported by [4]. However, this device is costly and inconvenient for domestic applications. Some other methods apply optical markers e.g. [11] in

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Multi-scale phase separation by explosive percolation with single-chromatin loop resolution

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ABSTRACT

The 2 m-long human DNA is tightly intertwined into the cell nucleus of the size of 10 μm. The DNA packing is explained by folding of chromatin fiber. This folding leads to the formation of such hierarchical structures as: chromosomal territories, compartments; densely-packed genomic regions known as Topologically Associating Domains (TADs), or Chromatin Contact Domains (CCDs), and loops. We propose models of dynamical human genome folding into hierarchical components in human lymphoblastoid, stem cell, and fibroblast cell lines. Our models are based on explosive percolation theory. The chromosomes are modeled as graphs where CTCF chromatin loops are represented as edges. The folding trajectory is simulated by gradually introducing loops to the graph following various edge addition strategies that are based on topological network properties, chromatin loop frequencies, compartmentalization, or epigenomic features. Finally, we propose the genome folding model - a biophysical pseudo-time process guided by a single scalar order parameter. The parameter is calculated by Linear Discriminant Analysis of chromatin features. We also include dynamics of loop formation by using Loop Extrusion Model (LEM) while adding them to the system. The chromatin phase separation, where fiber folds in 3D space into topological domains and compartments, is observed when the critical number of contacts is reached. We also observe that at least 80% of the loops are needed for chromatin fiber to condense in 3D space, and this is constant through various cell lines. Overall, our *in-silico* model integrates the high-throughput 3D genome interaction experimental data with the novel theoretical concept of phase separation, which allows us to model event-based time dynamics of chromatin loop formation and folding trajectories.

1. Introduction

The human genome, during interphase, is hierarchically packed in the nucleus with structures at different scales, organizing DNA into functional components [46,27,49,39] (Fig. 1A). Chromatin at the highest scale is separated into two major compartments: compartment A, where the chromatin has a wider spacing between the nucleosomes and is more transcriptionally active, enriched by histone modifications, such as H3K4me3, H3K27ac, H4K16ac; and compartment B, where the fiber is more tightly packed and transcription is limited [33,40,28]. Microscopy studies show that the compartments are generally spatially separated in the cell nucleus [42]. The next scale in the hierarchy is the existence of the chromosomes, which occupy distinct territories in the nucleus of the cell [12,35] and only partially overlap [3]. The chromatin is further divided into domains with a relatively large number of internal contacts, called Topologically Associating Domains (TADs) [38,11,8] Chromatin Contact Domains (CCDs) [46]. These contacts include chromatin loops mediated by factors like CCCT-binding factor (CTCF) and cohesin, or enhancer-promoter contacts

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Article

Unveiling the Molecular Mechanism of Trastuzumab Resistance in SKBR3 and BT474 Cell Lines for HER2 Positive Breast Cancer

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Abstract: HER2-positive breast cancer is one of the most prevalent forms of cancer among women worldwide. Generally, the molecular characteristics of this breast cancer include activation of human epidermal growth factor receptor-2 (HER2) and hormone receptor activation. HER2-positive is associated with a higher death rate, which led to the development of a monoclonal antibody called trastuzumab, specifically targeting HER2. The success rate of HER2-positive breast cancer treatment has been increased; however, drug resistance remains a challenge. This fact motivated us to explore the underlying molecular mechanisms of trastuzumab resistance. For this purpose, a two-fold approach was taken by considering well-known breast cancer cell lines SKBR3 and BT474. In the first fold, trastuzumab treatment doses were optimized separately for both cell lines. This was done based on the proliferation rate of cells in response to a wide variety of medication dosages. Thereafter, each cell line was cultivated with a steady dosage of herceptin for several months. During this period, six time points were selected for further in vitro analysis, ranging from the untreated cell line at the beginning to a fully resistant cell line at the end of the experiment. In the second fold, nucleic acids were extracted for further high throughput-based microarray experiments of gene and microRNA expression. Such expression data were further analyzed in order to infer the molecular mechanisms involved in the underlying development of trastuzumab resistance. In the list of differentially expressed genes and miRNAs, multiple genes (e.g., *BIRC5*, *E2F1*, *TFRC*, and *USP1*) and miRNAs (e.g., hsa miR 574 3p, hsa miR 4530, and hsa miR 197 3p) responsible for trastuzumab resistance were found. Downstream analysis showed that *TFRC*, *E2F1*, and *USP1* were also targeted by hsa-miR-8485. Moreover, it indicated that miR-4701-5p was highly expressed as compared to *TFRC* in the SKBR3 cell line. These results unveil key genes and miRNAs as molecular regulators for trastuzumab resistance.

Keywords: microRNA; microarray; HER2; breast cancer; drug resistance

A Fuzzy Multi-criteria Decision Making Approach for Analyzing the Risks and Benefits of Opening Data

Ahmad Luthfi, Zeenat Rehena, Marijn Janssen, Joep Crompvoets

Towards a Framework for Context-Aware Intelligent Traffic Management System in Smart Cities

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ABSTRACT

In the last few years, the smart city concept resulted in the development and deployment of platforms for providing innovative services to improve sustainability and the living standards. These platforms integrate data collected from devices and citizen-generated data and thereafter employ big data analytics to create insights from the data. These platform enable the creation of context-aware Intelligent traffic management systems (ITMS), however the involvement of various actors at different stages hampers development. In this paper, we propose a framework to support sustainable traffic management system for providing better commute, safety and security during travel based on real-time information. The framework should help to integrate the activities performed by the various actors. The main key elements of this framework are Datasets, Traffic Management Analytics, Actors and Actions which are taken by these users. The framework helps to create an overall overview of the activities needed. In this way it can be used to improve the quality of the traffic flow, increase efficient use of resources, smooth and safe commute of the citizens.

CCS CONCEPTS

• **Networks** → **Network services**; **Cloud computing**; • **Computer systems organization** → *Embedded and cyber-physical systems*; *Sensors and actuators*;

KEYWORDS

Intelligent traffic management system; congestion; big data; context-aware computing; smart transportation; smart mobility; smart city

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1 INTRODUCTION

The increasing level of urbanization and growth in size and number of cities in different parts of the world has resulted in both challenges and opportunities. Due to this huge growth and rein by technology, traditional approaches to city management and maintaining urban life style can be improved. Following this trend, many governments at different levels - regional, national, international, have initiated programs on digital and smart cities [2]. The initiatives contribute to national and international health, economy, infrastructure, resources and transportation to provide high quality of comfort to their citizens. Smart city has become one of the most promising, prominent and challenging application in the area of WSN, IoT and Big data analytics, but has been criticized for not being able to hold if promises [4].

Among various application areas of smart cities, intelligent traffic management system has significant impact on day to day life of the citizen. The limitation of the existing transportation infrastructure led to the severe traffic congestion and in turn increasing travel times. Smart transportation services are necessary even in cases with no traffic congestion [3]. Yet, data can be used to improve the utilization of transportation infrastructure without having to change the infrastructure. In [1] and [8], it can be seen, for an example, that the Rio de Janeiro draws together real-time data streams from thirty agencies and try to manage a large, complex city. The dashboards are used by the city managers and analyst to monitor the system or the city how it works as a whole.

However, most other large cities in the world are still suffering from traffic congestion, delay in response time to incidents, loss of time and money for being simply stuck in traffic. In addition, one of the most critical consequences of traffic congestion impact the operation of emergency services, such as medical, fire, rescue operations and police services etc. These services demand efficient and timely response of emergency vehicles. Further, in parallel to the growth of population existing road sizes are not expanded in the same proportion. As a result, vehicle crashes are more often happened in the narrow, congested roads as the drivers or the travellers want to go fast to avoid congestion on road. In turn, it affects the social aspects of the city life. Finally, due to the modern city life-style demands shorten commuter journey, reliable and accurate traffic prediction, early detection of bottlenecks on road, parking management etc.

The existing traffic management systems do not provide sufficient and accurate road information regarding traffic to control and timely monitoring and management of the traffic system. They have not situational awareness, although much data are available. Therefore, it is necessary to ensure that data can be collected and used

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A Profile of Tramways in Kolkata - A Sustainable Urban Public Transport

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Abstract

Transportation is one of the foremost catalysts of the urban economy as it gives the necessary pace to it by means of connection between and among the places. The basic transport modes that serve commuters and other people to move in and around the urban area are Bus, Cabs, Trains, Metrorail, Ferry, and Trams. Among them, the tram is the only non-polluting as well as a sustainable mode of mass transport. In India, Kolkata is the only city where the Tram is till now operating. The cab is very expensive, unfriendly for mass transit of passengers and also polluting one. Buses carry less number of passengers compared to trams and exert a huge black fume in some cases. And Metro rail on the other hand, although apparently seems to be non-polluting but it exerts substantial pollution effect by means of its tremendous sharp sound which is so harmful and involves a huge costing for constructed operation and management. In this respect, tramcars stand out in comparison to other vehicular modes within the transportation system of Kolkata for its uniqueness. However, Kolkata is the only city where this service is still running with remarkable transformation in terms of its decreasing coverage area, passenger turnover, earning and basic infrastructure over the years. In the case of developed countries, the Tramways case is different. The present paper attempts to trace the underlying scenario of spatio-temporal dimensions of tramways of Kolkata and identify the management and technical gaps to be redressed. To comprehend the overall present picture, tramcars professing passengers, operators, maintenance workers, management personnels are interviewed, and historical perspective is also added, to collect data from the reliable sources.

Introduction

Urban transport is a medium through which people, goods, and services are transported from one part of the city to another and keeps the urban life dynamics. A proper urban transport should facilitate a reliable, safe, time-bound, environment and pocket-friendly and comfortable journey. Any million plus city should plan for a good efficient public mass transit system (Report of Ministry of Urban Development, 2006). In the field of urban mass transportation of Kolkata, the first organized effort was made by the tramways during the late 19th century (Halder, 2008). Trams are cheap, pollution-free and one of the safest mode of transport. Being run on electricity but an accident rate is almost negligible. It stands out as one of the most efficient modes of mass transport in the present world. But in many cases today, it causes the emission of other motor vehicles more than they normally do by creating obstacles against the smooth running of motor vehicles. According to the Centre for Science and Environment (CSE), the quantity of all three major air pollutants namely, CO, hydrocarbons, and nitrogen oxides, drastically increase due to the reduction of motor vehicle speeds. Although it is very safe and disciplined as it moves along its track. Moreover, as a cheap, comfortable, luxury and overall peaceful journey, the tram is the most dependable one. Its speed is reduced furthermore from the expected one due to many interventions in front of it.

Materials and Methods

The study is based on the analytical probe of secondary data collected from various officials such as Works Manager-Nonapukur, Chief Engineer (Overhead & Cable), Chief Accounts Officer, Law Claims Officer and others of West Bengal Transport Corporation (WBTC), the amalgamation of

Calcutta Tramways Company and other state-owned transport corporations, head office and depots as well as termini under it. Besides, data have been also collected from Kolkata Metropolitan Development Authority (KMDA) and Bureau of Applied Economics and Statistics, W.B. In addition to that primary data has been collected through administering survey schedule among of the employees of trams in WBTC at the depots and termini and also of the passengers, commuters, and pedestrians in the areas served by trams.

The Study Area

The selected area for study is the Kolkata Municipal Corporation (KMC) extended from 22°30'N to 22°37'N and 88°18'E to 88°23'E. It comprises 142 wards clustered in 15 boroughs with an area of 187.33 km^2 and a total road space of only 6 percent of the total built-up area. It has a population of 4.58 million (Census of India, 2011) and a passenger load of 18.70 million on an average weekday (KMDA, 2011).

Phases of Origin

Trams have served the city of joy as one of the major modes of transports since its inception in 1880. Since the time trams made its maiden journey from Sealdah to Armenian Ghat, it has gone through vast modernizations and still rolls down the tracks of Kolkata. Kolkata has remained the Capital of the British Indian Empire for 137 years. Trade and commerce flourished and a fast mode of transport was, therefore, necessary to make trade commercially more viable. This was well understood by Mr. Parish Alfred of London and Mr. Chauter of Liverpool. With the co-operation of Kolkata Municipal Corporation, they incorporated the Calcutta Tramways Company Limited (CTC) in 1880. The same year on 10th November tramways was introduced in Kolkata with horse-drawn coaches. The main idea behind the inception of tramcars was to carry goods arriving from villages at Sealdah for transport to different parts of India through Railways. The merchandise had to be unloaded at Armenian Ghat and then carried on boats or bullock carts to Howrah Station. India holds the pride of being one of the few countries of the world to run tramcars. In the past trams ran in the cities of Kolkata, Delhi, Mumbai, Chennai, Nasik, and Kanpur. But Delhi, Mumbai, Chennai, Nasik, and Kanpur have terminated their tram service during the early and mid-twentieth century. Opening and closing years of these tramways are shown in Table - 1.

Profile of Tramcars and Networks

Presently WBTC holds around 220 operational fleets, out of which 50 to 60 trams on an average are put on the road which plies through the heart of the city covering track length of about 40 km operating from 6 depots and 7 termini out of which very few are presently in operation. The Fig.-2 shows that the tram network of Kolkata has gone through a modification to a considerable extent since its inception. The tram service in Kolkata was first incepted in 1873 from Sealdah to Armenian Ghat which was subsequently closed in that year. Most of the lines have been incorporated in the British Raj Period. The post-independence period extension of tramlines was very little. Unfortunately, this period witnessed a havoc closure in the frequency of tram services. Recently an opinion trend in administrative level is often heard that tram causes congestion in Kolkata and as a result of it, a lion's share of tram routes have been subsequently closed which are shown in the map with their year of closure. But such a trend of opinion is nothing but the result of apparently wrong perception and lack of appropriate awareness and conception about eco-friendly and cheap mass transportation.

Table- 2 shows that the overall passenger carriage is varying with routes. The thing of utmost significance is that the number of passenger carriage is substantially high in the segregated track, i.e. Esplanade to Khidderpore part due to its hassle-free motion. On the other hand, the passenger carriage is comparatively low in the part of Howrah Bridge and Rajabazar section due to excessive traffic pressure and common sharing of the road with other mass transport modes. In all the total passenger share of the tram is comparatively low due to the absence of timely availability and hindrances.

As far as closure of tramways is concerned it has been seen that the introduction of new lines and closure of the existing lines have gone side by side. The first closure occurred in 1971 when Howrah to Bandhaghat and Shibpur line was closed. In 1973, Burrabazar to Nimtala line was closed. In the year 1980, several lines were closed. Among them, Esplanade to Jatin Das Park (for Metro Rail project) and Mirzapur crossing to Bowbazar are notable. In 1982, Sealdah to Lebutala line was closed. In 1995, Strand Road to High Court line was closed. In 2004, Gariahat depot to its crossing line was closed for the construction of Gariahat Overpass. In 2006, Mominpur to Behala line was closed. Similarly, in 2009, Shyambazar to Galiff Street line was closed. In 2011, Joka to Behala Line was closed due to the construction of the Metro rail project. Lastly in 2016-18, Park Circus lines, Sealdah- Moulali lines, etc have also been terminated. Belgachia portion is although under maintenance, but most of the officials have opined that there is hardly any possibility of reopening of this line. As a result, there is a considerable decrease in the number of tramcars too (Fig- 3).

Depot and Terminus

A *Tram Depot* means a garage or sheds for the trams where ox-bow fashioned or linear fashioned lines are present to change the direction of tram after it finished the journey at that place and they are kept after the diurnal tram service is over. In case of Calcutta Tramways, the code name is imprinted in front of the tramcar of the respective depot it belongs to. For example, BL is the code form of Belgachia depot and this code is written on each tram of this depot.

A *Tram Terminus* means an in-transit place where ox-bow fashioned or linear fashioned lines are present to change the direction of tram after it finished the journey at that place. From the figure (Fig 4), it may be said that the concentration of the tram depots and termini follow the differential importance of urban space in Kolkata i.e. the higher commercial and nodal value in respect to commutation lies more in Central Kolkata. Besides, in reference to table-2, it is important to note that, in spite of the existence of the said depots and terminus, BBD Bag, Belgachia, Kalighat and Galiff Street are presently not in function. The officials have given a number of reasons in support of it. But the matter of utmost concern is that, in all the previous experiences, it has been observed that the once closed

service of tram route has never been restarted in Kolkata. If this trend continues, these depots and termini are on the verge of extinction.

Drivers and Conductors: The Running Staffs

Calcutta tramways have huge manpower which is basically constituted with the drivers and conductors of the tram. They are the most important persons to make a tram trip proper. Besides, in each depot and termini, there are some maintenance staff and one or two starters. But when a tram is on road, the only staff present in the tramcar is the Driver and the Conductor. In WBTC trams, each car has two conductors in case of a 2-coach tram and one conductor in case of a single one. There is one driver in each tram. They are appointed either as a nominee or by direct recruitment. Presently, as of 2017, they are total 750 in number which shows an exact ratio of 2 conductors and 1 driver for a double coach tram. Their pay scale is the same as of a clerk of Writers'. But since 1992, there was no permanent recruitment for the operation of trams.

Commuters' Profile

Trams, in the years of its inception served a huge population. However, the daily passenger volume has been decreasing over the years from 2803 lakhs in 1975-76 and 2246 lakhs in 1984-85 to a mere 70 lakh passengers at present, which is still a very significant number in comparison to the total passenger volume of the city. Daily passengers may constitute an average of about a hundred in each route, though they vary significantly on holidays. These people board trams for purposes like a journey to work, regular shopping trips, etc. Among the surveyed passengers most of them were non-regular passengers who travel in tram either once a week or hardly. However, the survey shows that females between the age-group of 30-60 years and males between the age-group of more than 60 years usually travel daily. Passengers record a maximum of male passengers between the age-group of 30 to 60 years (Fig- 5).

People choose tram as a mode of travel usually because of the smooth and comfortable journey it provides through the busy streets of the city. Kolkata displays an uncontrolled mix of incompatible forms of traffic in its streets, resulting in overtaking, congestion and therefore frequent accidents. A tram follows a fixed track and is not responsible for overtaking and the vices thus caused, instead ensures a safe journey. It is seen that people over 60 years on board a tram particularly because of its smooth and disciplined journey through the tracks. The other factors which lead to the choice of tramcars as a mode of transport are its negligible accident rates, its low fare structure, and its less crowded bogies. The fact that it is eco-friendly, does not usually guide a person's choice of mode though the survey showed that there were quite a few exceptions i.e. mainly aged people and school going and returning students and guardians (Fig- 6).

Current Situation

From the diagram aside (Fig- 7), a clear picture is presented here about the economic condition of Calcutta Tramways. It is shown here that the expenditure is rising continuously throughout the time whereas the income is quite disappointing. There is no significant increase in the income of the tramways. As a result of this incident the all over service is degrading day by day and proper care is lacking in its operation.

From the diagram (Fig- 8), it is observed that among the mass transport modes of roadways i.e. Bus, Minibus and Trams, Bus and Minibus are far behind the Tram with respect to passenger carrying capacity while compared with fuel consumption. When a bus and Minibus carries 80 and 50 passengers on average optimality, a double coach tram can carry nearly 200 passengers in an optimum average condition in a more or less same fuel consumption rate. A bus/Minibus costs Rs.15-16 /km whereas a tram costs Rs. 12-13/km. Moreover, there is a huge oil crisis in present-day whereas the electricity is self-producing and the fuel i.e. current used by tram is non-polluting.

Recommendations

a) A detailed study should be undertaken to examine the feasibility of replacing the present tram system by LRTS (Light Rail Transit System) on some selected corridors to act as an intermediate mode of mass transit. Some of the prospective routes may be- along B.T. Road from Shyambazar to Dunlop Bridge, along E.M. (Eastern Metropolitan) Bypass, along Belgharia Expressway, along Foreshore Road in Howrah, along Diamond Harbour Road to Joka, along VIP Road (Kazi Nazrul Islam Avenue), etc.
b) As an attempt to recover the loss, some tramcars should be prepared for heavy goods carriage form the city fringe to city core and provision for separate tracks for their movement. Such track may be provided in the bypass routes where public traffic is less. If this proposal can be properly implemented, then the congestion due to huge sized lorries can be minimized in many areas which are notoriously known for jam.
c) Modernization and automation of the depots, termini, and workshops should be done and technological measures should be taken to reduce the noise of tramcars and make a smooth and less jerking movement. Some of the modern facilities should be incorporated in the coaches i.e. A.C., Wi-Fi facility only in the coaches, music system, GPS for live tracking, stop announcement, etc. They can attract passengers.
d) A proper route-wise time schedule must be prepared to keep in mind the peak and lean time of passenger's demand. In this regard, it may be incorporated with those smartphone apps which the passengers use to locate their transport modes. Above all, the punctual execution of the time table is very necessary in this regard.
e) Wherever possible segregated tract should be introduced to facilitate faster movement as well as let other vehicles move smoothly.

Conclusion

The matter of utmost astonishment is that while the developing countries like Germany, Czech Republic, Switzerland, U.K., etc are trying to enriching their tram service and making it as a highly dependable mode of commutation, India, more specifically Kolkata, in spite of having basic infrastructural settings, are impoverishing this medium day by day. To improve urbanization and to save the pride of tramways of Kolkata, tram development oriented schemes, integrating and coordinating

policies and interventions should be vigorously adopted. However though it has lost much of its hype, sheer, and luxury, and drastically reduced in number in the era of luxurious cars and bikes, tramways system in Kolkata would probably take yet another decade to fade away. It has still managed to brave the odds and thrives in the roads of Kolkata with its same old promise of a safe, comfortable and smooth journey as during its glorious days along with eco-friendliness and sustainability fulfillment. What is lacking, however, is the care once Kolkata had for its most convenient and the cheapest mode of commuting in the city. There is a need for rethinking. Reorientation of the undertaking, efficiency in management, rationalization of routes and modernization of the system would help the tramways to provide valuable service to the city.

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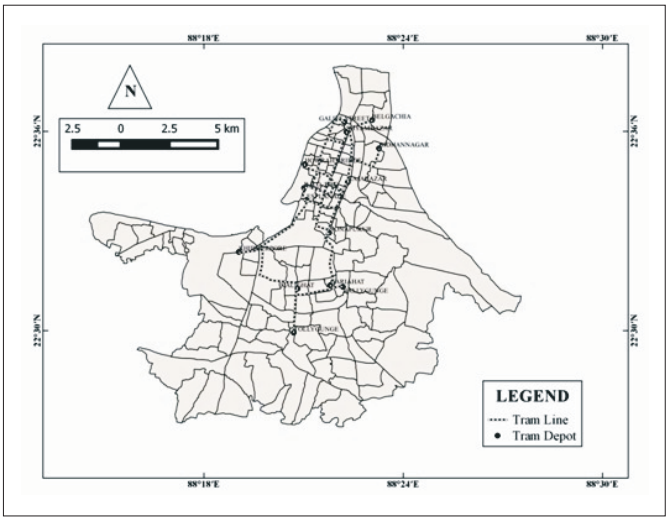

Fig. 1: Network of Tramways in Kolkata (2018)

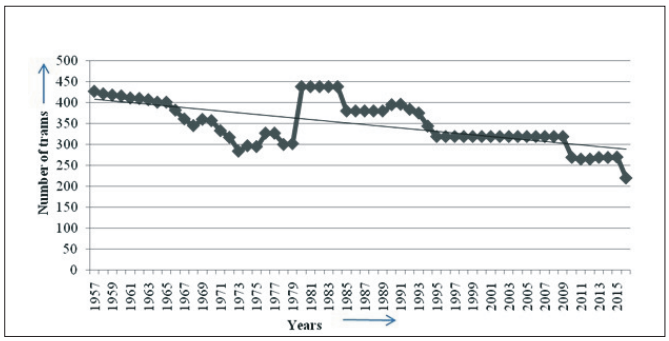

Fig. 3: Trend of Tram Service during the Post-Independence period

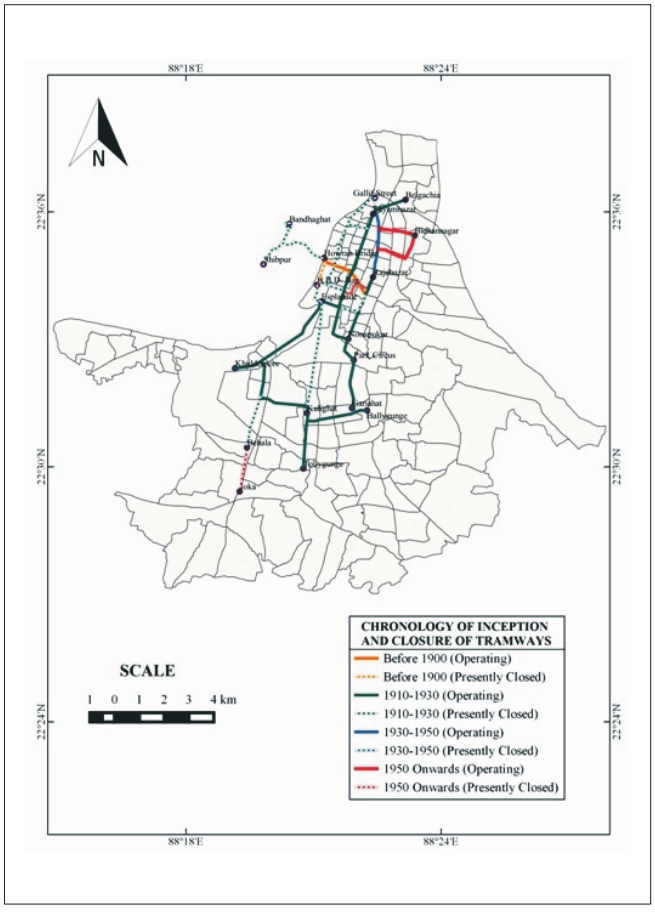

Fig. 2: Growth and decay of Tramway Network in Kolkata

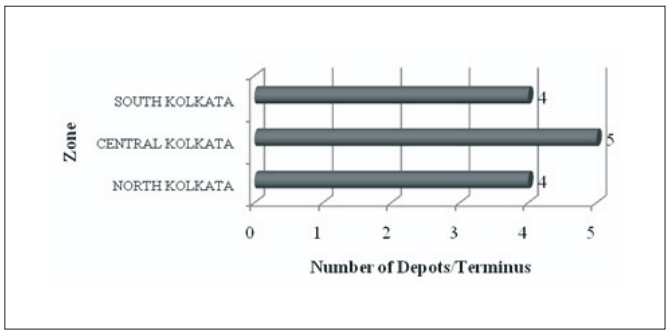

Fig. 4: Distribution of Tram depots and termini

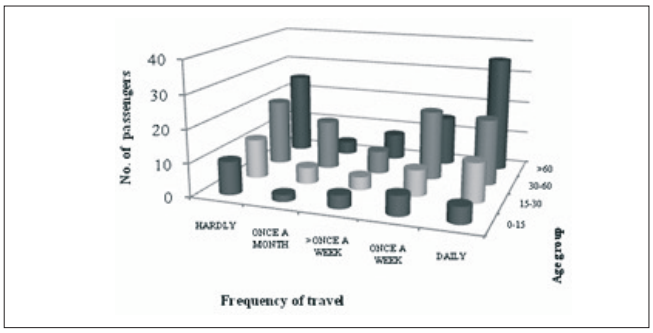

Fig. 5: Travel Frequency *(Source- Field survey, 2018*

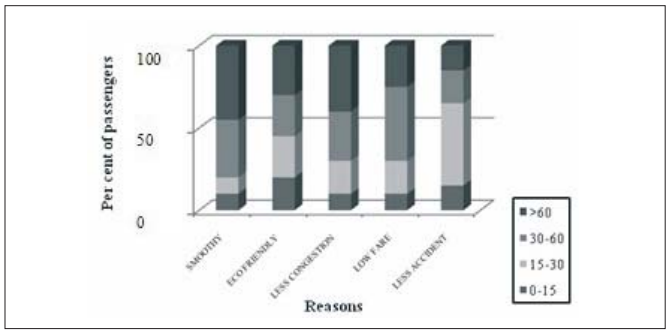

Fig. 6: : Reasons for Travel *(Source- Field Survey,2018)*

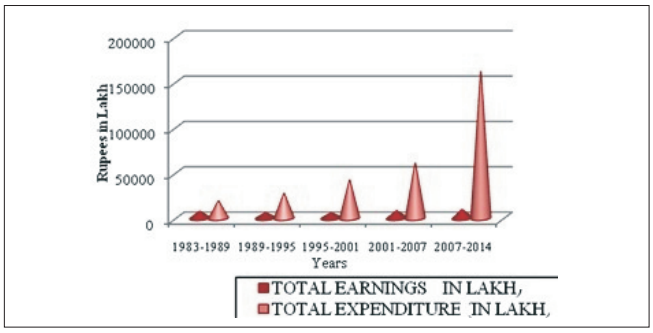

Fig. 7: : Contrast between Income and Expenditure *(Source:WBTC, 2018)*

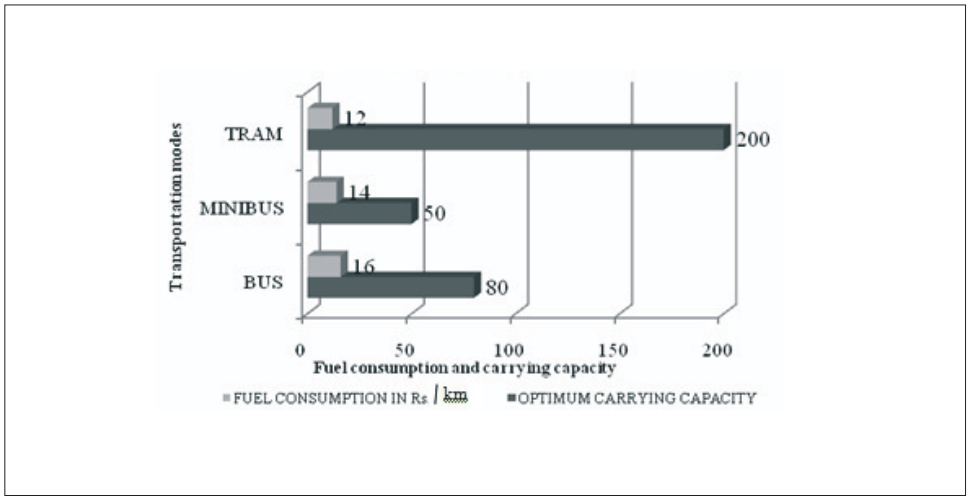

Fig. 8: Comparison of passenger carrying capacity *(Source- Experts of Motor Vehicles and Trams, 2018)*

Table-1: Year of Opening and Closings of selected Tram Systems in India

City	Opening Year	Closing Year
Kolkata	1873	*Running*
Mumbai	1874	1964
Nasik	1889	1933
Chennai	1895	1953
Kanpur	1907	1933
Kochi	1907	1963
Delhi	1908	1963
Bhavnagar	1926	1947

Source: WBTC Office, 2018

Table - 2: Temporal profile of the tram routes of Kolkata

Route No.	Year of commissioning	Year of closure	Whether segregated/elevated or not	Origin (Depot)	Destination tail end/depot)	Total length in km	Double tracked through out or not	No. of trips per day (up-down)	Passengers ferried per day	Earning (Rs) per day	Remark
1	1903	Open	No	Belgachia	Esplanade	7.29	Yes	NA	NA	NA	Closed due to Repairing
2	1920	2018	No	Belgachia	BBD Bag	6.81	Yes	NA	NA	NA	-
4	1920	2018	No	Belgachia	BBD Bag	6.92	Yes	NA	NA	NA	Via Grey Street
5	*1903*	*Open*	*No*	*Shyambazar*	*Esplanade*	*5.13*	*Yes*	*5*	*300*	*1800*	-
6	1920	2017	No	Shyambazar	BBD Bag	5.13	Yes	NA	NA	NA	-
8	1920	2017	No	Galiff Street	BBD Bag	5.13	Yes	NA	NA	NA	-
10	1920	2018	No	Shyambazar	BBD Bag	5.13	Yes	NA	NA	NA	Via Grey Street.
11	1903	2018	No	Belgachia	Howrah Bridge	6	Yes	NA	NA	NA	Closed due to Repairing
12/1	1915	2017	No	Rajabazar	Esplanade	3.19	Yes	NA	NA	NA	-
12/7	1905	2017	No	Galiff Street	Esplanade	6.92	Yes	NA	NA	NA	-
14	1915	2017	No	Rajabazar	BBD Bag	4.81	Yes	NA	NA	NA	-
15/12	*1915*	*Open*	*No*	*Rajabazar*	*Howrah Bridge*	*3.6*	*Yes*	*4*	*100*	*600*	-
16	1985	2017	No	Bidhannagar	BBD Bag	7.15	Yes	NA	NA	NA	-
17	1985	2018	No	Bidhannagar	Esplanade	6.62	Yes	NA	NA	NA	-
18	*1985*	*Open*	*No*	*Bidhannagar*	*Howrah Bridge*	*8.15*	*No*	*3*	*80*	*480*	-
20	1923	2014	No	Park Circus	Howrah Bridge	6.85	Yes	NA	NA	NA	Via Wellington
20/17	1923	2014	No	Park Circus	Bidhannagar	9.25	No	NA	NA	NA	-
21	1923	2014	No	Park Circus	Howrah Bridge	7.75	Yes	NA	NA	NA	Via College Street
22	1923	2013	No	Park Circus	Esplanade	5.65	Yes	NA	NA	NA	-
24	1928	2015		Ballygunge	Esplanade	10.5	Yes	NA	NA	NA	-
24/29	1928	2015	No	Tollygunge	Ballygunge	4.66	Yes	NA	NA	NA	-
25	1930	2017	No	Gariahat	Esplanade	8.65	Yes	NA	NA	NA	-
26	1930	2016	No	Gariahat	Howrah Bridge	9.68	Yes	NA	NA	NA	-
26/17	1985	2014	No	Gariahat	Bidhannagar	12.5	No	NA	NA	NA	-
29	*1903*	*Open*	*Part*	*Tollygunge*	*Esplanade*	*4.99*	*Yes*	*8*	*450*	*2700*	-
29/36	*1910*	*Open*	*No*	*Tollygunge*	*Khidderpore*	*7.55*	*Yes*	*7*	*350*	*2100*	-
36	*1902*	*Open*	*Part*	*Khidderpore*	*Esplanade*	*4.99*	*Yes*	*8*	*500*	*3000*	-
36/8	1903	2001	Part	Khidderpore	Bagbazar	9.7	Yes	NA	NA	NA	-
-	*2016*	*Open*	*No*	*Rajabazar*	*Bidhannagar*	*5.2*	*No*	*6*	*250*	*1500*	-

(*Source: Prepared by the authors based on WBTC data, 2018)*

Table - 3:Tram Depots and Terminus under WBTC

Depots	Terminus
Belgachia (BL) *(Temporarily closed for repairing)*	Bidhannagar
Rajabazar (RB)	Shyambazar
Gariahat (GH)	B.B.D. Bag *(Closed)*
Kalighat (KG)*(Closed)*	Esplanade
Tollygunge(TG)	Howrah Bridge
Khidderpore (KP)	Galiff Street *(Closed)*
Nonapukur(Workshop)	Ballygunge *(Closed)*

(Source: WBTC Data, 2018)

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An Approach for Adaptive Traffic Light Control System in ITS using VANET

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***Abstract*—Traffic congestion is a common problem in every day's life as number of vehicles is increasing day by day on the road. So, traditional road traffic control system needs to be updated accordingly. An adaptive traffic light control system can solve the traffic congestion problem efficiently. Vehicular Ad-hoc Network (VANET) is a common and useful application for designing an adaptive traffic light control system as a part of Intelligent Transportation System (ITS). This paper presents a literature review work on different types of traffic control systems and proposes a method for designing an adaptive traffic light control system using VANET technology. The proposed system ensures that all the vehicles pass through a road intersection point in an urban area smartly and efficiently. It also reduces traffic congestion and solves some other problems related to congestion by improving traffic flow through an intersection point in a city area.**

***Index Terms*—Intelligent Transportation System, VANET, Adaptive Traffic Light Control**

I. Introduction

According to Federation of Automobile Dealers Association (FADA) data, in the third quarter of 2022, India sold 5,938,844 units of cars. Whereas, just a year ago, this number was 4,632,020 units. That means, year-over-year growth in auto retail sales in the third quarter was 28.2% [1]. At present, despite the rapid increase in the number of vehicles on the road, the problem of traffic congestion has not been solved even with the development of road infrastructure. Population and number of vehicles on the road are increasing rapidly in spite of poor public transport system and road network in the urban areas.

In these scenarios, inefficient traffic control system generates traffic congestion, which is the prime cause of decreasing productivity and standard of living in urban areas. Higher traffic in the city areas generates a number of severe problems. One such problem is the increase of air pollution caused by huge emission of harmful gases (CO_2, CO, NO_2, SO_2, HC $etc.$) from the vehicles waiting at the red signal of the road intersection points. Another problem is the wastage of fuel which is caused by the excessive delay at the intersections. Rear-end vehicle collisions also occur due to sudden stoppage of the front vehicles at a yellow or red signal. Noise pollution is also a serious problem.

In the recent years, with huge development in information and communication technology (ICT), intelligent transportation system (ITS) gains attention from academia, industries and standardization bodies. An ITS provides smart, safe and fast traffic management system to drivers, passengers as well as pedestrians on the road. A number of intelligent technologies, such as VANET are applied to transform conventional transportation system into more updated and fast transportation system that behaves intelligently. In order to implement an ITS, advanced technologies and concepts are used to collect traffic data in real time. Next, the collected data is used for first studying and then acquiring knowledge on traffic flow from different aspects. There are mainly two categories of traffic data, one is quantitative and the other is qualitative [2]. Queue length, car length, trip time, waiting time, average lane speed etc. of a road network belongs to category of quantitative data. Qualitative data includes identifying accident prone zone, detecting traffic congestion etc. In order to know the nature of traffic flow on a road and congestion created at a junction, both types of data need to be used.

In the existing literature, some useful solutions to traffic congestion problem are proposed. These approaches use devices like camera, CCTV, wireless sensor, GSM and cellular tower etc., and various technologies like satellites, RFID, GPS, image processing etc. [3] [4]. However, the existing solutions are expensive as those are based on the use of CCTV camera and image processing techniques, or GPS and satellite. Some of these solutions require an overall knowledge of traffic movement. On the other hand, we focus on building a system which is less expensive and

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Smart parking management system with dynamic pricing

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Abstract. Smart parking is becoming more and more an integral part of smart city initiatives. Utilizing and managing parking areas is a challenging task as space is often limited, finding empty spaces are hard and citizens want to park their vehicles close to their preferred places. This becomes worse in important/posh areas of major metropolitan cities during rush hour. Due to unavailability of proper parking management system, citizens have to roam around a lot in order to find a suitable parking area. This leads to the wastage of valuable time, unnecessary fuel consumption and environmental pollution. This paper proposes a smart parking management system (SPMS) based on multiple criteria based parking space reservation algorithm (MCPR) that allows the driver/owner of vehicles to find and reserve most appropriate parking space from anywhere at any time. The system also considers the concept of dynamic pricing strategy for calculating parking charge in order to gain more revenue by the government agencies as well as private investors. The system employs sensors to calculate concentration index, average inter-arrival time of vehicles of a parking area for better parking management and planning. The simulation results show that proposed system reduces the average extra driving required by the users to find a parking area and hence it will reduce traffic congestion, which in turn reduces air pollution caused by unnecessary driving to find a proper parking area.

Keywords: Smart cities, smart parking, traffic congestion, IoT, sensors, dynamic pricing

1. Introduction

Due to the increase in population in the cities there is a need to utilize available resources in a better way. City dimensions are increasing day by day throughout the world and 70% of the population will live in cities by 2050 [3]. At the same time the number of registered cars are also increasing due to rural to urban migration of people and socio-economical growth. In [33] recent studies show that a car is parked 95% of its lifetime and run only for the 5% on an average in a year. Finding a proper parking space in a major metropolitan area becomes more and more challenging day by day. The users are forced to park their cars on the roads which hampers the ongoing traffic. In cities like Nagpur, Pune, Amritsar etc. in India more than 40% of the road network is being used for on-street parking

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SANCTION ORDER

F.No. 142/CRP-2023-1640/PMUY/SCD **Dated: 27-09-2023**

To,

The Registrar
Gauhati University, Guwahati
Assam, 781014

Subject: Sanction of **Short-term Empirical Research Project (Collaborative/Individual)** entitled **"Pradhan Mantri Ujjwala Yojana: An Impact Assessment in Relation to the Life of Women in Assam and West Bengal"** to **Dr. Bimal Kumar Kar, Gauhati University, Guwahati**

Dear Sir/Madam,

1. The Indian Council of Social Science Research (ICSSR) has approved the award of **"Pradhan Mantri Ujjwala Yojana: An Impact Assessment in Relation to the Life of Women in Assam and West Bengal"** the above Research Project submitted by **Dr. Bimal Kumar Kar** of your Institution.

2. The study, as proposed by the researcher, is to be located at and financially administered by your institution as per the guidelines of this award.

3. The ICSSR has sanctioned a grant-in-aid of **Rs. 1600000/-** for the above research project and the grant will be released as follows:

First instalment (50 % of sanctioned grant-in-aid)	**:**	**Rs. 800000/-**
Second instalment (25 % of sanctioned grant-in-aid)	**:**	**Rs. 400000/-**
Final instalment (25 % of sanctioned grant-in-aid)	**:**	**Rs. 400000/-**
Total	**:**	**Rs. 1600000/-**
Overhead charges over and above 7.5% or maximum Rs.1,00,000	**:**	**Rs. 100000/-**

4. The **First** installment of the approved grant-in-aid will be released after receiving the grant-in-aid bill duly filled in, stamped and signed by the Project Director as well as the affiliating organization**.**

5. As the study involves empirical research, the finalized schedules/questionnaires (2 copies) designed to elicit information should be sent to the ICSSR as per the following schedule:

   a) If the schedule /questionnaire for eliciting information is as per standard questionnaire, these will have to be sent to ICSSR immediately,

   b) If the schedule /questionnaire for eliciting information are to be designed afresh keeping in view the requirements of the project, these will have to be sent to the ICSSR within a period of two months in any case.

6. The Second instalment will be released after receiving a satisfactory **three months** progress report, data summary report, along with a statement of expenditure for the first instalment and Grant-in-Aid Bill for second installment.

7. The Third and Final instalment will be released on receipt of (a) Satisfactory book length of the Final Report (Two Hard Copies plus one Soft Copy in Pen-Drive) in the publishable form after incorporating all corrections, suggestions of the expert; (b) soft and 2 hard copies of Executive Summary of Final Report; (c) Statement of accounts with Utilization Certificate in GFR of 12A form for the entire project amount duly signed by the Finance Officer/Registrar/Principal/Director of the affiliating institution (d) A certificate of statement of assets and books purchased out of the project fund issued by the affiliating institution. (e) The Grant-in-Aid Bill for the third installment.

8. Research undertaken by a Project Director may be reviewed by the Monitoring and Advisory Committee constituted by ICSSR and the project may be discontinued/ terminated, if research progress is found unsatisfactory or any ICSSR rules/guidelines are violated.

9. The Project Coordinator/Project Director would organize a workshop before submission of the final report. The workshop would deliberate on data collection process, compilation, organization and analyses of data on the respective scheme/policy initiative.

10. The ICSSR reserves all rights to publish the project funded by it, provided the work is recommended for publication by the ICSSR appointed expert/experts. In case, ICSSR approves the publication of the research work, the scholar should acknowledge that the project has been sponsored by the ICSSR, in all publications resulting from the project output (Research Paper, Books, Articles, Reports, etc.) and should submit a copy of the same to the ICSSR.

11. The Contingency Grant may be utilized for research and office assistance, books, stationary, computer cost, research assistance and the field work expenses of Project Coordinator, Co-Project Directors and research personnel connected with the research work.

12. The University/ Institution of affiliation will provide to the scholar office accommodation including furniture, library and research facilities and messenger services. For this, the ICSSR shall pay to the University/Institution of affiliation **overhead charges @7.5%** or maximum Rs. 1,00,000/- of the total expenditure incurred on the project only after successful completion of the project.

13. The accounts and the Utilization Certificate will be signed by the Finance Officer/Registrar/Principal/Director in the case of accounts of the institution are audited by CAG/AG. Otherwise, they need to be signed by the Finance Officer and the Chartered Account.

14. The Project Coordinator/ Project Director of the research project will be **Dr. Bimal Kumar Kar**, who will be responsible for the completion of the research project within **5/6 Months** from the date of commencement of the project, which is **6th September 2023** as intimated by the scholar.

15. In case, the Project Coordinator/Project Director fails to submit the periodic / final project report as per schedule with adequate justification, the scholar will be debarred from availing all financial assistance from ICSSR in future.

16. All grants from ICSSR are subject to the general provision of GFR 2017 and in particular with reference to the provision contained in GFR 209, GFR 210, GFR 211 and GFR 212.

17. The Project Coordinator/Project Director will ensure that the expenditure incurred by him conforms to the approved budget heads. The grant-in-aid is subject to all the conditions laid down in the **Indian Council of Social Science Research (ICSSR) Research Projects available in the ICSSR website www.icssr.org**

18. The expenditure on this account is debatable to the **Budget Head-ICSSR (Scheme Code 0877); OH 31.09 Research Projects**.

19. All instalments will be transferred through Public Finance Management System (PFMS) and ICSSR shall implement the EAT module for ensuring transparency of expenditure at all levels and to ensure that there is no parking of funds.

20. As per the instruction from MoE, the amount of grant sanctioned herein is to be utilized by **the end of the project duration.** The unspent amount shall be refunded to the ICSSR immediately on the expiry of the duration of the project. If the grantee fails to utilize the grant for the purpose for which the same has been sanctioned/or fails to submit the audited statement of expenditure within the stipulated period/ or fails to submit the final report within the stipulated time, the grantee will be required to refund the amount of the grant released with a penal interest thereon @ 10% per annum.

Yours faithfully,

(Sd/-Dr. Richa Sharma)
For MEMBER-SECRETARY

Encl: as above.

Copy to:

1. **Dr. Bimal Kumar Kar**
   Professor, Department of Geography
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   Kolkata-700 160
7. Finance Branch, ICSSR, New Delhi
8. Record file

(Sd/-Dr. Richa Sharma)
For MEMBER-SECRETARY

PROJECT BUDGET

Title: Pradhan Mantri Ujjwala Yojana: An Impact Assessment in Relation to the Life of Women in Assam and West Bengal

By: Dr. Bimal Kumar Kar

S. No.	Heads of Expenditure	Value
1	Research Staff: Full time/Part-time/Hired Services	Not exceeding 40% of the total budget.
2	Fieldwork: Travel/Logistics/Boarding, Survey Preparation or Consultancy etc.	Not exceeding 30%
3	Workshop to disseminate the outcomes of the project	Up to 15% (not exceeding INR 2.00 lakh for collaborative research)
4	Equipment and Study material: Computer, Printer, Source Material, Books, Journals, Software, Data Sets etc.	Not exceeding 10%
5	Contingency	Not exceeding 5%
6	Institutional Overheads (over and above the total cost of the project)	Affiliating Institutional overheads @ 7.5% of the approved budget , subject to a maximum limit of Rs 1,00,000/-

- **Remuneration and Emoluments of Project Staff**

  (a)Project staff could be engaged by the Project Coordinator/Project Director on a full/ part-time basis during the research work and the duration/consolidated monthly emoluments of their employment may be decided by the Project Coordinator/Project Director within the limits of the sanctioned financial allocation and as per the ICSSR rules.

  (b) Research Associate @ Rs.40,000/- p.m.. (Qualification – Post graduate in any social science discipline with minimum 55% marks and NET/SLET/M.Phil/Ph.D)

  (c) Research Assistant @ Rs.32,000/-p.m.(Qualification-Ph.D./M.Phil./ Post graduate in social science discipline with minimum 55%)

  (d) Field Investigator @ Rs.30,000/-p.m. (not exceeding 3 months) (Qualification- Post graduate in any social science discipline with minimum 55% marks)

  (e)Retrospective payment for work already done is not permissible.

- **Re-appropriation**: The Institution may re-appropriate expenditure from one head to another up to 10% of the sanctioned budget with the prior approval of the ICSSR.
- **Selection of Research Staff** should be done through an advertisement and a selection committee consisting of (1) Project Coordinator/ project Director; (2) One outside Expert (other than the Institute where the project is located); (4) Head of the Department/Dean of relevant faculty.
- **For all field work related expenses** of Project Coordinator/Project Director, Co-Project Director and project personnel, rules pertaining to affiliating institutes shall be followed.
- **All equipment and books** purchased out of the project fund shall be the property of the affiliating institutions. On completion of the study, the Project Coordinator/ Project Director shall submit an undertaking in this regard. The ICSSR, however, reserves the right to take charge of equipment and books, if it thinks it fit in a case.
- **Purchase of equipment/ assets** for the Research Project is permissible only if it is originally proposed and approved by the ICSSR and does not exceed the permissible amount.
- **No publication/presentation** in any form related the awarded research shall be made by the researcher or any member of the research team without prior approval of the ICSSR.

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To
AKM Anwaruzzaman
Aliah University
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Sir,

As per decision of Board of Research Studies dated on 23.08.2018, I would like to inform you that members of the Board of Research Studies have been nominated your name as a Co-supervisor of Mr. Samsul Hoque, a Research Scholar, Department of Geography, Raiganj University along with Dr. Nuruzzaman Kasemi, Associate Professor Department of Geography, Raiganj University and principal guide of the scholar.

Your co-operation in this regard to this assignment is solicited.

With thanks,
Yours truly,

(Dr. D. Sarkar)
Registrar
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Copy forwarded for information to:-

1. The Secretary of the Hon'ble Vice-Chancellor, Raiganj University
2. The HoD of Geography, Raiganj University
3. Guard File

Suitability of the Lower Ganga basin groundwater for irrigation, using hydrogeochemical parameters and land-use dynamics

GIS Applied to Soil-Agricultural Health for Environmental Sustainability | Published: 03 January 2023
Volume 30, pages 116831–116847, (2023) Cite this article

Environmental Science and Pollution Research

Aims and scope →

Submit manuscript →

Mohd Sayeed Ul Hasan & Abhishek Kumar Rai

Abstract

The northern Ganga basin is one of the most densely populated basins in the world. Most agricultural and industrial contaminants drained in the river length are likely to be accumulated in the lower part of the Ganga basin. In this study, we have used ten parameters obtained from 495 sampling locations, besides using long-term climate data (GLDAS_NOAH025_M) to understand the irrigation suitability using the TOPSIS model. Multi-criteria decision making (MCDM) model using TOPSIS has been used to make the best choices from the available finite number of alternatives based on their ranking. The entropy weights for the irrigation suitability parameters such as electrical conductivity (Ec), sodium adsorption ratio (SAR), magnesium hardness (MH), sodium percent (Na%), total hardness (TH), Kelly's ratio (KR), permeability index (PI), chloride concentration (Cl^-), groundwater level fluctuation (GWLF), and the Lang factor (Df) are found to be 0.08, 0.14, 0.02, 0.02, 0.04, 0.08, 0.01, 0.32, 0.29, and 0.01, respectively. We find that SAR, Cl^-, and GWLF control the water quality for irrigation in the Lower Ganga basin since these parameters have relatively higher entropy weights (more than 0.10). The results obtained from the computed performance index or the closeness coefficient show that the area percent having very good and good groundwater quality for irrigation in the Lower Ganga basin is 77.03% and 22.97% respectively. The land-use change dynamics for the between 2000 and 2015 estimated using the transition matrix shows a positive percentage change for settlement (133.50%), wetland (35.04%), and bare area (0.98%); however, several other classes such as the agriculture (- 0.85%), forest (- 0.49%), grassland (- 14.38%), sparse vegetation (- 11.39%), and water (- 4.12%) show a decreasing trend. The highest amount of percentage change was observed in settlement areas which were contributed by other land-use classes such as agriculture (694.43 km^2), water (41.61 km^2), forest (16.77 km^2), and grassland (1.86 km^2). The results may be useful to the concerned organization for the proper planning and management of water resource for sustainable development.

Deployment of entropy information theory in the Indian Sundarban region using hydrogeochemical parameters and GIS for assessment of irrigation suitability

Research | Published: 19 September 2023
Volume 195, article number 1227, (2023) Cite this article

Environmental Monitoring and Assessment

Aims and scope →
Submit manuscript →

Sabir Hossain Molla, Rukhsana & Mohd Sayeed Ul Hasan

Abstract

The evaluation of irrigation suitability plays a crucial role for the socio-economic development of the society, especially in the region of Sundarban. For sustainable agricultural practices, groundwater quality must be suitable for irrigation; otherwise, it can degrade soil and diminish crop yield. The entropy information theory, several irrigational indices, multivariate statistics, GIS, and geostatistics are used in this work to evaluate the geographical distribution and quality of groundwater in the Indian Sundarban region. In total, 33 groundwater samples were collected in 2018 (April and May), and they were evaluated for major cations, anions, as well as other parameters like electrical conductivity (EC), soluble sodium percentage (SSP), potential salinity (PS), total dissolved solids (TDS), Kelly ratio (KR), sodium absorption ratio (SAR), permeability index (PI), residual sodium carbonate (RSC), magnesium hazard (MH), and residual sodium bicarbonate (RSBC). The overall trend of the principal cations and anions is in the sequence of $Na^+ \geq Mg^{2+} \geq Ca^{2+} \geq K^{2+}$ and $HCO_3^- \geq Cl^- \geq NO_3^- \geq SO_4^{2-} \geq F^-$, respectively, whereas the spatial variation of %Na, SAR, RSBC, and MH demonstrate very poor irrigation water quality, and spatial variation of KR, RSC, SSP, PI, and PS signifies that the irrigation water quality is excellent to good. In order to identify the specific association and potential source of the dissolved chemical in the groundwater, statistical techniques like correlation and principal component analysis were also employed. The hydrochemical facies indicates that mixed type makes up the bulk (51.51%) of the water samples. Following the Wilcox plot, more than 75% of the water samples are good to doubtful; however, by the US salinity hazard map, roughly 60.60% of the samples had high salinity (C3-S1 zone). The EWQII reports that no samples fall into the very good (no restriction) category, whereas 30.30%, 30.30%, and 39.40% of the sample wells record good (low restriction), average (moderate restriction), and poor (severe restriction) irrigation water quality, respectively. Based on this study, the bulk of the groundwater samples taken from the study area are unsuitable for cultivation. The findings of this study will also help decision-makers develop adequate future plans for irrigation and groundwater resource management.

Open Access Article

Quantitative Analysis of Land Use and Land Cover Dynamics using Geoinformatics Techniques: A Case Study on Kolkata Metropolitan Development Authority (KMDA) in West Bengal, India

by Ratnadeep Ray [1], Abhinandan Das [2], Mohd Sayeed Ul Hasan [3], Ali Aldrees [4], Saiful Islam [5], Mohammad Amir Khan [6] and Giuseppe Francesco Cesare Lama [7,8,*]

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Open Access Feature Paper Article

On the Precipitation Trends in Global Major Metropolitan Cities under Extreme Climatic Conditions: An Analysis of Shifting Patterns

by Ali Aldrees [1], Mohd Sayeed Ul Hasan [2,3], Abhishek Kumar Rai [2], Md. Nashim Akhtar [3], Mohammad Amir Khan [4,*], Mufti Mohammad Saif [3], Nehal Ahmad [3] and Saiful Islam [5]

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Spatiotemporal Analysis of Future Trends in Terrestrial Water Storage Anomalies at Different Climatic Zones of India Using GRACE/GRACE-FO

by Mohd Sayeed Ul Hasan [1,2], Mufti Mohammad Saif [2], Nehal Ahmad [2], Abhishek Kumar Rai [1], Mohammad Amir Khan [3], Ali Aldrees [4], Wahaj Ahmad Khan [5], Mustafa K. A. Mohammed [6] and Zaher Mundher Yaseen [7,8,*]

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Application of Geostatistical and Geospatial Techniques for Groundwater Quality Vulnerability Assessment Using Hydrogeochemical Parameters: A Case Study of NCT Delhi

Chapter | First Online: 03 December 2022

pp 105–116 | Cite this chapter

Monitoring and Managing Multi-hazards

Mohd Sayeed Ul Hasan, Sufia Rehman, Nadeem Akhtar, Abhishek Kumar Rai, Samina Wasi, Md Nashim Akhtar & Shams Tabrez

Part of the book series: GIScience and Geo-environmental Modelling ((GGM))

Abstract

We use an integrated approach for evaluating groundwater vulnerability using the multi-criteria decision making (MCDM), statistical, and geographic information system (GIS). Hydrogeochemical data from 50 sample points were converted to a surface raster using the inverse distance weightage method. The literature survey indicates absence of systematic study of the water quality vulnerability in the study area. Ten thematic layers namely pH, total dissolved solid (*TDS*), bicarbonate (HCO_3^-), chloride (Cl^-) sulfate (SO_4^{2-}) nitrate (NO_3^-), fluoride (F^-), calcium (Ca^{2+}), magnesium (Mg^{2+}), and total hardness (TH) as calcium carbonate were used for the weighted overlay analysis. Our analysis indicates that the NCT Delhi region can be classified into five classes based on groundwater vulnerability i.e. very low, low, moderate, high, and very high. The result shows that percentage of the area of groundwater vulnerability is very low (17.9%), low (22.0%), moderate (20.7%), high (19.9%), and very high (19.5%) respectively. The land use pattern of the study area was found to be 1.53% of the land covered with water, 5.46% trees, 0.36% grass, 0.01% of flooded vegetation, 28.69% of crops, 3.64% of shrubs, 59.97% as the built-up area, and 0.35% as the bare land, for the year 2020.

Journal of King Saud University – Science 34 (2022) 102332

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Original article

Assessment of Drought vulnerability through an integrated approach using AHP and Geoinformatics in the Kangsabati River Basin

Raied Saad Alharbi [a], Shaminee Nath [b], O. Mohammed Faizan [c], Mohd Sayeed Ul Hasan [d,*], Shamshad Alam [a], Mohammad Amir Khan [e,*], Sayantan Bakshi [f], Mehebub Sahana [g], Mufti Mohammad Saif [d]

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ABSTRACT

This study focuses on the application of multi-sensor satellite archived data products and ancillary data for the evaluation of drought vulnerability. The use of a subjective model, namely Analytical Hierarchy Process (AHP) integrated with Geographical Information System (GIS) and various influencing parameters, emerged as a powerful tool for the gauged and ungauged watershed. The Kangsabati river basin, located in the southern part of West Bengal (India), is facing issues of overexploitation of groundwater, climate variation, and unsystematic agricultural practices that are inducing the water crisis and vulnerability of the basin to drought conditions. In this study, 11 parameters, namely elevation, slope, aspect, LULC, population density, normalized difference vegetation index (NDVI), normalized difference drought index (NDDI), land surface temperature (LST), normalized difference water index (NDWI), vegetation condition index (VCI), and soil moisture index (SMI) were used to delineate the drought in the catchment of Kangsabati River. Findings of this study using Analytical Hierarchy Process (AHP) integrated with a GIS platform, show that, nearly 28.5% of the area falls under the medium drought category, followed by the high (21.1%), no drought (20%), low (19.5%), and very high (10.6%) drought categories in the study area. The study also suggests Nature Based Solution (NBS) in Disaster Risk Reduction (DRR) strategies such as ecosystem-based approaches (EBA) and blue infrastructure for Drought Risk Reduction for drought mitigation in the study area.

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Original article

Hydrometeorological consequences on the water balance in the Ganga river system under changing climatic conditions using land surface model

Mohd Sayeed Ul Hasan [a,b], Abhishek Kumar Rai [a,*], Zeesam Ahmad [b], Faisal M. Alfaisal [c], Mohammad Amir Khan [d], Shamshad Alam [c,*], Mehebub Sahana [e]

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ABSTRACT

The United Nations Sustainable Development Goal (SDG) ensures adequately accessible water and management for all. Due to the rapid increase in population and industries along the Ganga river, it is necessary to estimate the water budget to fulfill the demand for water in the future. The Mann-Kendall (MK) test conducted on the Noah-Land Surface Model data for 72 years results in a maximum declining trend of water budget in the Yamuna Lower (Q = −3.82 BCM/year), and a minimum in the Damodar sub-basin (Q = −0.10 BCM/year). All the sub-basins show an increase in groundwater level (mbgl) except the Kali Sindh, which shows a decreasing trend (Q = −0.07 m/year). The percentage change was also estimated in all the sub-basins, including various parameters such as precipitation, evapotranspiration, runoff, water budget, and temperature. The extremely severe groundwater drought was estimated using the Standard Groundwater Level Index (SGWLI), from which the values for the Ram Ganga Confluence (SGWLI = 2.44; 2005), Upper stream of Gomti (SGWLI = 2.06; 2014), Ghaghra (SGWLI = 2.22; 2005), Ram Ganga (SGWLI = 2.28; 2005), Yamuna Lower (SGWLI = 2.13; 2007), Kali Sindh (SGWLI = 2.30,2.67; 2002, 2003), Chambal Upper (SGWLI = 2.30,2.20; 2001, 2003), Son (SGWLI = 2.02; 2010), Gandak (SGWLI = 2.37; 2010), Kosi (SGWLI = 2.08; 2012), Damodar (SGWLI = 2.72; 2010), and Bhagirathi (SGWLI = 2.06; 2014) were obtained for a total of 62,050 observed well data.The obtained in-situ point data is converted into the surface raster using a geostatistical technique. Our results show a declining trend in the water budget of all the 19 sub-basins of the Ganga basin and also the groundwater drought in several parts.

Assessing flood-induced ecological vulnerability and risk using GIS-based in situ measurements in Bhagirathi sub-basin, India

Original Paper | Published: 27 July 2021
Volume 14, article number 1520, (2021) Cite this article

Arabian Journal of Geosciences

Aims and scope →
Submit manuscript →

Sufia Rehman, Mohd Sayeed Ul Hasan, Abhishek Kumar Rai, Ram Avtar & Haroon Sajjad

Abstract

Climate change–induced disasters and anthropogenic influences are making the ecological environment vulnerable. Thus, assessment of ecological vulnerability and risk is essential for devising suitable adaptation and management strategies. The paper makes a concerted effort to analyze flood-induced ecological vulnerability and risk using site-specific parameters in Bhagirathi sub-basin of India. Analytical hierarchy process (AHP) was used to assign weightage to the selected parameters. Association of parameters with vulnerability was examined through multiple regression analysis. Findings revealed that most of the area in eastern, central, and deltaic sub-basin was found under high vulnerability and risk. Disturbance index, rainfall, temperature, SAVI, vegetation type, low biological richness, slope, and NDVI identified the potent factors for high vulnerability to flood, while high inundation was the prime determinant for very high flood risk in the study area. Evaluated findings may be helpful in prioritizing the areas for ecological restoration and conservation.

GeoJournal
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Slums in India: making sense of place in urban planning

Jaidul Islam · Md. Julfikar Ali · Sk Mithun

Accepted: 5 December 2020

Abstract Cities are the growth engine of national wealth and income production; however large number of city dwellers circumvents from the mainstream, are snubbed dwellers called slum population. Existence of slums in the urban units is a challenging issue in urban planning. India experiences a very sharp growth rate of slum population over the decades. Present work focuses on a conundrum of uninterrupted slum growth in spite of the implementation of many slum removal policies in India. The state-level household amenity status reflects a quite debatable agenda as to whether or not slum up-gradation policies are succeeded and works as a significant planning tool. The up-gradation of individual slum unit through the bottom-up approach of plan may act as effective action. This work finally directs a comprehensive planning tool for slum up-gradation as well as overall urban development, by placing the slum issues in urban planning practice.

Keywords Slum dweller · Policy gap · Slum up-gradation · Household amenity index · Urban planning

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Introduction

In a near future, majority of human population in developing countries is likely to live in urban area and it has been predicted that in India around 50% of its total population or 600 million people will live in the urban area in 2020 (Loughhead and Mittal 2000). With the rapid pace of urbanisation in developing countries, it is estimated that one-third of the urban population over the world lives in the dearth of even basic needs i.e., shelter, food, drinking water and so on, and they reside in overcrowded and congested environments (UN HABITAT 2003). Though cities are the growth engine of national wealth and income production and it is predicted that in India around 70% GDP will be generated by its cities (Sankhe et al. 2010) but a large number of dwellers in cities circumvent from the mainstream (National Building Organisation 2011), these snubbed dwellers are the slum population. Basically, slums are the informal settlements in an urban area characterised by improper housing stock and low standard of living (National Building Organisation 2013), socially vulnerable (Loughhead and

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Urban green spaces for elderly human health: A planning model for healthy city living

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Healthy city living, Bottom-up planning

ABSTRACT

Green space is considered as the lungs of the city. It has immense health benefits mainly for elderly people. Regular physical activity in green space considerably reduces health risk of cardiovascular disease, respiratory problems, high blood pressure, paralysis, diabetes and other chronic diseases. Besides, it facilitates social interactions and promotes the sense of community among the citizens, which is very important for health and wellbeing of people, especially for elderly, because they predominantly suffer from the social isolation problem. The data on self-perceived health status have been obtained while surveying the green space users through survey schedule. About 92.65% of elderly sampled of those people who are reportedly affected by any of such diseases or a combination of multiple. Similarly, in Australia 85–90% of diabetes problems was found among the elderly. UGS benefits must be universal and this can be done through the universalization of its accessibility. This paper answers the questions as, Whether or not the health risk of NCD make elderly people necessary for visiting and using the green space? Whether or not the visit and use of park consequences better preconception on NCD related physical and psychological health? What factors restrict and motivate them to visit the green space? What would be the appropriate planning approach for making it available for neighbourhood residents? The paper finally proposes a participatory, bottom-up planning model as a planning toolkit.

1. Introduction

In the web of urbanization, people in highly urbanized areas tend to have more symptoms and a high risk of lifestyle related with non-communicable diseases. Today's modern urban life has turned into a complex mode. Rapid unplanned urbanization changes urban life predominantly. The busy and technology dependent urban life has brought changes in people's lifestyle and the related behaviour which exposes people to the high risk of non-communicable diseases (WHO, 2010). Non-communicable diseases (NCDs), mainly Obesity, Cardiovascular Disease, Cancers, raised Diabetes, Respiratory Diseases, raised Blood Pressure, leads to premature death. NCDs globally causes around 70% of all deaths (Tabish, 2017). The increased burden of morbidity and mortality due to NCDs is much in the industrialized countries like India (Patra and Bhise, 2016). NCDs are usually emerges due to the long exposure to an unhealthy lifestyle involving tobacco and alcohol usage, stress, anxiety, lack of physical activity, rapid unplanned urbanization-industrialization-commercialization, consumption of the high-fat products and extended office working hours (Senapati et al., 2015). Though the people of all age group are having risk factors of such diseases, the increased aging becomes more vulnerable (Egger, 2014). Health risk turns severe at the old age than all other lower age categories. A long exposure to the related lifestyle and environmental determinants and their accumulation across the long-life durations happens to reason the elder more vulnerable to the NCDs and makes them urgent to visit the UGS for physical exercise (Egger, 2014). Physically activeness, good health and social well-being are associated with UGS utilization. Regular physical activity significantly reduces the risk of NCDs. As per WHO (2010), the elder people should do at least 150 min of moderate intensity of physical activity in every week to attain better health condition. Therefore, UGS has an immense health and well-being benefit for elder citizens (WHO, 2016, p.17) by providing an ecologically and environmentally suitable place for their related physical activities. A good health is the fundamental requirement of socio-psychological wellbeing of elderly. The elderly suffers several NCDs, therefore, they need more access, more use of green space and more being connected with nature. Their health risk could be reduced by getting them into the UGS as to closer to the nature and for performing

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Research Journal

Microsystem Technologies

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Micro- and Nanosystems

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Volume 28 · Number 12 · December 2022

Special Issue on Computing, Communication and Sensor Networks
Guest Editors: Abhishek Das · Dulal Acharjee · Debashis De

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28(12) 2573–2828 (2022)

A Framework for Developing IoT and Edge Computing based Smart Transportation Applications

Poojarini Mitra[1,3], Zeenat Rehena[2], and Nandini Mukherjee[3]

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Abstract. Transportation is one of the main sectors responsible for negative environmental impacts. Integrating emerging technologies can help provide real-time, resilient, and intelligent solutions that are necessary for decarbonizing road transport. This paper presents a novel framework that combines the Internet of Things (IoT), Edge Computing, and Cloud Computing to deliver sustainable and efficient transportation solutions. The proposed framework facilitates the development of smart transportation applications that envision an efficient way of reducing emissions, optimizing traffic flow, and improving overall transportation efficiency by leveraging the huge storage and computational power of Cloud Computing and the real-time data processing capabilities of Edge Computing. In addition, the virtual sensor is employed by the framework in order to reduce the adaptability, interoperability, and heterogeneity constraints in the IoT environment. This paper examines the shortcomings of current systems, highlights the essential elements of the framework, and assesses the framework's effectiveness in providing effective and efficient smart transportation services.

Key words: Smart Transportation System, Environmental Sustainability, Internet of Things, Edge Computing, Cloud Computing, Virtual Sensors

1 Introduction

From the beginning of civilization, the art and science of moving from one place to another have been one of the most important necessities for humans. In the modern-day world, with the dramatic expansion of the urban dimension, one of the major concerning factors is the impact of transportation systems on the sustainability of the environment [1]. The transportation system is currently the highest contributor towards increased emission of greenhouse gases (GHG) and noise pollution resulting in global warming and rising health hazards [2].

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Levels of Gender Disparity of Literacy in the district of Malda, West Bengal: A Geospatial Analysis

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Abstract

Gender disparity in literacy is one of the basic problems of the Indian society. Though the overall literacy rate is gradually increasing, the female literacy rate still lags behind the male literacy rate throughout the country. This disparity in literacy hampers the all round development of the society. Malda as a district with low literacy records high gender disparity in literacy. According to 2011 census, out of nineteen districts of West Bengal Malda occupies the second last position in terms of literacy rate. The lower literacy and high gender disparity in literacy are obstructing the societal development of the district. Moreover, spatial variation in gender disparity is a serious and contentious issue in the process of development of the district. The present research work aims at highlighting the trends and regional variations of gender disparity in literacy in Malda district. The study reveals that the male literacy rate is substantially higher than the female literacy rate in every block. This disparity also exists by residence (rural-urban) in the district. The work is mainly based on secondary sources of data which have been collected primarily from Census of India, District Statistical Handbook etc. Tabulated data have been synthesized and analyzed using MS Excel-2007, ArcGIS (version 10.3) to draw the suitable maps and diagrams.

Introduction

In India, due to prejudice against women, socially, economically, culturally and politically women are not considered at par with men and as a result of it, they are lagging far behind men in almost every sphere of life (Kumar, Kumar & Rani, 2016). Literacy is the strong instruments which give empower to women against social inequality and injustice. The central and state government has taken many initiatives for the women empowerment in general and to eradicate gender disparity in literacy in particular. The National Policy on education, 1986 (NPE, 1986) put special emphasis on removing disparities and to offer educational opportunity by providing the specific requirements of those who for long years have been denied equality. It was also to remove of women's illiteracy as well as obstacles created in the way of their access to, and also retention in, elementary level of education was to receive overriding priority, routed through provisions of some special support services, making it time-bound, and also effective monitoring. The primary emphasis was laid on women's involvement in vocational, technical and skill-based education at different levels (MHRD, 1986). The NPE, 1986 has paid special attention to educationally deprived communities in the interest of social justice and equality. The Government of India went ahead with the 'Saakshar Bharat Mission (SBM)', a new map of the National Literacy Mission on eve of International Literacy day so that complete literacy can be achieved (Day, 8 September 2009). "This plan covered 365 districts in 26 states and UTs, all of which had adult female literacy rates less than 50 percent as per the census of 2001. The primary center of attention of the mission was on women and its intention was to cover a total of 70 million adults for 15 years and above age. The scheme intended to reduce gender and other disparities by providing fundamental education in the country (Kumar, Kumar and Rani, 2016). Despite the implementation of a number of such initiatives, there still remains a huge disparity between in male and female literacy rates. The study area i.e. Malda district as such suffers from high gender

disparity in literacy in the state.

The Study Area

Malda district has been selected as the study area which is the southernmost district of North Bengal. At present, it is under Jalpaiguri Division which is created on 4th March in 1963. Before it, the district was under Presidency Division (Census, 1961). The district occupies the second rank in terms of growth rate of population in the state with 21.24%which is much higher than the state average of 13.84%. It is located between the latitudes of 24º 40' 20" N to 25º 32' 08"N and the longitudes of 87º 45' 50"E to 88º28'10" E. The southern part of the district is surrounded by Murshidabad district across Ganga River, the east and the north-eastern part by Bangladesh and South Dinajpur, northern part by North Dinajpur District and the western part by the state of Bihar and Jharkhand (GoWB, 2007).

As per 2011 Census report, Malda district covers an area of 3733 sq. km which shares 4.2% of the total area of the state of West Bengal. The district consists of two sub-divisions and fifteen C.D. blocks. Under the Malda Sadar sub-division, there are nine C.D. blocks viz. English Bazar, Manikchak, Kaliachak-I, Kaliachak-II, Kaliachak-III, Gazole, Old Malda, Habibpur, Bamongola whereas Chanchal sub-division composed of six C.D. blocks viz. Ratua-I, and Ratua-II, Chanchal-I, Chanchal-II, Harishchandrapur-I Harishchandrapur-II, and It is the home and permanently resting ground of 3988845 persons which shares 4.37% of the total population in the state in which only 13.58% urban population while 86.42% resides in the countryside. The sex ratio is 944 and the literacy rate is 61.73% wherein the male and female literacy is 66.24% and 56.96% respectively (Census of India, 2011).

Objectives

The following are the specific objectives of the present study:

1) To examine the trend of the extent of gender disparity in literacy in Malda district.
2) To examine the spatial variations of gender disparity.
3) To propose a few strategies for the eradication of gender disparity in literacy in the district.

Rationale of the Present Study

The present study investigates the gender disparity in literacy of Malda district of West Bengal. It is necessary to measure the gender disparity at the micro level to understand the real picture of the women empowerment and to formulate the proper plan to eliminate gender disparity by the block level administration. The study is unique in the sense that it measures the trend of the gender disparity of the district since 1951 as well as the C.D. block has been considered as the smallest unit of the study. So, the findings of the study may be fruitful to formulate and implement the proper strategies to remove the gender disparity at the block level.

Materials and Methods

The present work is mainly based on the secondary sources of data which have been collected from the District Census Handbook, District Statistical Handbook and from the website of Census of India. Some books and journals have been reviewed to complete the work. To measure the extent of gender disparity in literacy, the male-female literacy data of the district have taken into consideration while to examine the spatial variations of gender disparity C.D. block has been considered as the unit of analysis. The collected data has been tabulated and analyzed by suitable maps and diagrams to draw the proper inferences. Different software like MS Excel-2007, ArcGIS (version 10.3) has been used to draw suitable maps and diagrams. The literacy has been calculated according to the definition of Census of India, 2011. According to the Census definition (2011), following is the formula of the calculation of literacy rate:

$$Lr = \frac{L}{P} x100\%$$

where, L_r =literacy rate, L =No. of literates aged 7 years and above and P = total population excluding 0-6 year population.

The gender disparity in literacy is measured by adopting the Sopher's Disparity Index (1974) as modified by Kundu and Rao (1983):

Sopher's Disparity Index =

$$D_i = \log (X_2/X_1) + \log \{(100-X_1)/(100-X_2)\}$$

Kundu and Rao's Disparity Index =

$$D_i = \log (X_2/X_1) + \log \{(200-X_1)/(200-X_2)\}$$

Where, D_i =Disparity Index, X_2 = Male, X_1 = Female and $X_{2\geq} X_1$

Results and Discussion

Trends of Gender Disparity in Literacy Rate

Malda district is one of the marginalized districts in terms of literacy rate in West Bengal. The district occupies 18th position in literacy rate among 19 districts of the state. The literacy rate of the district is always far behind the state average since 1951. According to the 2011 census, the literacy rate of the district is 61.73% which is quite behind the state average of 74.04%. The female literacy rate of the district is always a worse situation. The female literacy rate has crossed the 50.00% marks for the first time in 2011. Hence the district is characterized by low literacy rate and the high gender gap in literacy. Figure 1 presents the trends of the gender gap in literacy of the district since 1951. In 1951, the total literacy rate was 11.68% while the corresponding figure for the males and females were 18.10 and 5.00%. Therefore, the gender gap was absolutely high. With the passage of time the total literacy rate of the district is gradually increasing but unfortunately, the gender gap is increasing till 1991. In 1991, the gender gap was stood at 20.68% which is declined by only 3.13% points and reached 17.55% in the 2001 census. But 2011 census shows that this gap suddenly narrowed down to 9.28% which is the positive sign for the development of the society of the district.

Rural-Urban Differentials by Gender Gap (1951-2011)

The gender disparity exists by residence also. Figure 2 provides the vivid scenario of the differential literacy rate and the gender gap in literacy by rural and urban area. Due to the

different and underdeveloped socio-economic conditions in the rural area, the literacy rate is always far behind to that of the urban area of the district but the gender gap is quite high in both cases up to 1991. In 1951 and 1961, the gender gap is high in an urban area as compared to that of rural counterparts. After 1961, this gap started to reduce in an urban area and become low in 2011 while this gap for rural area is still high. Fortunately, with increasing literacy rate along with developed socio-economic condition, the gender gap in literacy is gradually declining in both rural and urban area. Our society is absolutely patriarchy in nature. That is why females are always deprived of all spheres of life.

Spatial Variations of Gender Disparity in Literacy

The gender disparity in literacy is not uniform throughout the district. This disparity varies from one region to another. The block level analysis reveals that the disparity index value ranged between 0.047 to 0.168 which is recorded in Ratua-II and Habibpur block respectively. On the basis of regional variations, the district has been divided into three regions i.e. areas of high, moderate and low gender disparity (Fig. 3):

Areas of Low Gender Disparity (Di ≤ 0.090): As per 2011 census, seven blocks out of fifteen have shown low gender disparity in literacy. The disparity index value varied between 0.047 to 0.087. The seven blocks belong to this group are Ratua-II (0.047), Chanchal-II (0.056), Kaliachak-I (0.058), Harishchandrapur-II (0.066), Chanchal-I (0.075), English Bazar (0.081) and Ratua-I (0.087). Except for Harishchandrapur-I, entire Tal region of the district has shown low gender disparity which is the positive sign for the district. It should be mentioned that all the blocks except Chanchal-I have recorded low literacy rate as compared to district average of 61.73 %.

Areas of Moderate Gender Disparity (Di: 0.091 - 0.130) : Only three blocks namely Kaliachak-II (0.096), Harishchandrapur-I (0.115) and Old Malda (0.121) block lie in this zone. It is very interesting fact that one block from each physiographic division i.e. Tal, Barind and Diara of the district belongs to this zone.

Areas of High Gender Disparity (Di ≥0.131): The high gender disparity is observed in five blocks such as Kaliachak-III, Gazole, Manikchak, Bamangola and Habibpur ranging the index value from 0.131 to 0.168. In spite of having the high literacy rate entire Barind region of the district except Old Malda has displayed high gender disparity in literacy.

From the above discussion regarding gender disparity in literacy the followings are the findings:

1) The gender disparity in literacy of the district is high and fluctuating since 1951. The gender gap was increasing till the census of 1991 and started to decline since 2001 and reached 9.28 % in 2011 from 13.28 in 1951.
2) There is a difference in gender gap by residence in which up to 1961 in a rural area this gap was low than that of an urban area but after 1961 this gap was gradually narrowed down and become low in an urban area while in a rural area this gap is still high. It is mainly due to the difference in educational level, socio-economic development, nature of jobs, educational facilities and cultural differences between rural and urban area.
3) The blocks having greater concentration of either Scheduled Caste (SC) and Scheduled Tribe (ST) or both categories of population are showing larger gender disparity (Annexure-I). On the other hand, the Muslim concentrated blocks show low gender disparity. It is mainly due to the lower gender disparity in literacy among the Muslim community than the others in the district (Annexure-II).

Government Initiatives to Eliminate Gender Disparity in Literacy

"Universalization of Elementary Education (UEE) has been accepted as a national goal in India. Central and state governments are making strenuous efforts to achieve this goal (GOI,)." There are several legal, constitutional and national statements for the Universalization of Elementary Education. Some of them are as follows:

a) ***Constitutional mandate, 1950:***"The State shall endeavor to provide, within a period of ten years from the commencement of this Constitution, for free and compulsory education to all children until they complete the age of 14 years."

b) ***National Policy of Education, 1986:*** "It shall be ensured that free and compulsory education of satisfactory quality is provided to all children up to 14 years of age before we enter the twenty-first century".

c) ***Unnikrishnan Judgement, 1993:*** "Every child/citizen of this country has a right to free education until he completes the age of fourteen years."

d) ***The Article 21-A and RTE-2009:*** "Right of children to free and compulsory education till completion of elementary education in a neighborhood school" (GOI, 2010).

In spite of the above mandates, there is a wide gender gap in literacy and moreover, about thirty crore population till now completely illiterate. In order to remove gender disparity and illiteracy and to achieve the Universalization of Elementary Education, the central government along with the concerned state government has taken a number of initiatives in different periods such as:

a. ***Mudaliar Commission (1952-53)*** is constituted for the improvement of the existing education system in the country.
b. ***Kothari Commission (1964-66)*** recommended a number of suggestions towards equalization of educational opportunities and to remove the regional disparity in literacy, it emphasized on girls education along with the education of SC, and ST and other deprived communities (MOE, 1966).
c. ***National Policy on Education, 1986*** was to provide equal educational opportunities to all, education for women's equality, women's access to vocational, technical and professional education, to promote quality education among all (MHRD, 1992).

d. ***National Literacy Mission, 1988*** was launched on 5th May 1988 to impart functional literacy to non-literates and aims at achieving of 75 % literacy rate by 2007. The Total Literacy Rate Campaign (TLC) was the main strategy of NLM for the eradication of adult illiteracy (MHRD, 1992).

e. ***District Primary Education Programme, 1994*** was launched to revitalize the primary education system and to achieve Universalization of Elementary Education

f ***Sarva Shiksha Abhiyan, 2001*** aimed at bridging up all gender and social gaps and to provide quality and useful and relevant education for satisfactory life for all children in the age group of 6-14 years.

g. ***National Programme for Education of Girls at Elementary Education, 2003*** is to promote the girls to access education and to improve the quality of girls' education and women empowerment. It is an integral component of SSA which provides additional support to enhance girl's education (MHRD, 2003).

h. ***Right to Education Act, 2009*** passed to facilitate making provision for free and compulsory education of all children in the age group of six to fourteen years as a Fundamental Right. That means every child is entitled to full-time elementary education of satisfactory and equitable quality in a formal education system which satisfies certain essential norms and standards (MHRD, 2010).

i. ***Mid-Day Meal Scheme, 1995*** is again a Centrally Sponsored Scheme, launched on 15 August 1995 keeping a view to enhancing enrolment, retention, and attendance and simultaneously improving nutritional levels among children.

j. ***Kasturba Gandhi Balika Vidyalaya, 2004*** was launched in August 2004 by the Government of India for setting up residential schools in Educationally Backward Blocks (EBBs) where rural female literacy (RFL) is below the national average and the gender gap in literacy is above the national average. The main objectives of this scheme are to ensure quality education for the girls predominantly belong to the socially disadvantaged groups like SC, ST, and Minorities and eliminate rural-urban and gender disparity in literacy.

k. **Rashtriya Madhyamik Siksha Abhiyan (RMSA, 2009)** was launched with the main objective to enhance access to secondary education and to improve its quality along with the removal of gender disparity by universal access to secondary education.

l. **Rashtriya Uchchatar Shiksha Abhiyan (RUSA, 2013)** aims at improving the quality of state's higher educational institutions along with fulfilling the important objectives of this scheme is remove regional disparities in access to higher education by setting up new higher education institutions in unserved & underserved areas and to provide equal opportunities in access to higher education to the educationally and socially marginalized classes along with SC and ST communities and promote inclusion of minorities, women and differently able persons.

m. **Beti Bachao, Beti Padhao (BBBP)** is to celebrate girl child and enable her proper education. The objectives of this scheme are to ensure survival and protection of the girl child, to prevent gender-biased sex-selective elimination and to ensure education and participation in all spheres of life of the girl child (MWCD, 2018).

n. ***Samagra Shiksha*****:** The newly launched scheme by the Government of India is Integrated Scheme of School Education popularly known as Samagra Shiksha which will be effective from the year 2018-19. It subsumes the three popularly education schemes of SSA, RMSA, and TEIs (GOI, 2018).

The Sustainable Development Goal for Education **(SDG)-4.1** states that "By 2030, ensure that all boys and girls complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes. Whereas the SDG 4.5 states that "By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations"

The major objectives of the Scheme are "provision of quality education and enhancing learning outcomes of students; Bridging Social and Gender Gaps in School Education; Ensuring equity and inclusion at all levels of school education; Ensuring minimum standards in schooling provisions; Promoting Vocationalisation of education; Support States in implementation of Right of Children to Free and Compulsory Education (RTE) Act, 2009; and Strengthening and up-gradation of SCERTs/State Institutes of Education and DIET as a nodal agencies for teacher training" (GOI, 2018-19, http://samagra.mhrd.gov.in/about.html).

Initiatives by the Government of West Bengal

The West Bengal Government has taken several initiatives for the women empowerment and to remove all type of social and gender disparity especially in literacy and employment. Some of them are as follows:

a) ***Kanyashree Prakalpa*** is a Conditional Cash Transfer (CCT) Scheme that provides incentivizes to the schooling of all teenage girls in the age group of thirteen and eighteen, at the same time dis-incentivizing child marriage. The Scheme goes much beyond financial enablement - it not only builds awareness of the scheme but also includes adolescent-friendly approaches events, competitions, and Kanyashree clubs. The endorsement of strong women figures as role models to promote helps empowerment. The scheme has been praised world-wide (DWCDSW, 2013).

b) ***Shishu Aloy: Quality Early Childhood Care and Education Centres for All***: The National Policy on Early Childhood Care and Education (ECCE) emphasizes early investment; it ensures early development most rapidly in the early years of life. It is evident that children who received assistance during their early years can achieve better success at school. Even during their adulthood their employment and earnings are better, better health, and lower levels of welfare dependency and crime rates less than those who did not receive early opportunities.

"*Early Childhood Care and Education programme in West Bengal has been cited as the most cost-effective equalizer to break the vicious cycle of inequity through evidence-based interventions are provided for all children and families, especially the most marginalized***" (MWCD, 2012).**

Besides the above-mentioned schemes, the government of

West Bengal is providing financial assistance in the name of 'Shikshashree', 'Rupashree' not only for financial enablement of women but also for the endorsement of strong women figures as role models to promote psychological and social empowerment. The government also distribute Bicycle free of cost to the students of class nine to twelve for the encouragement of education and literacy among all.

Conclusions and Recommendations

It has been seen that despite the implementation of several schemes and programmes by the Central and state Government since independence for the eradication gender disparity, the country and the study area i.e. Malda district as well are characterized by high gender disparity in literacy. Following measures are recommended for the eradication of all types of social gaps and gender disparities:

a) Universalizing the elementary education by setting up new girls' schools, providing proper school facilities particularly in the minority-dominated areas where education has not penetrated till the remotest corner.
b) Ensuring free nutritious food to the children up to completion of elementary education. The allocation of fund for MDMS is no way sufficient to cater to the need of nutrition of the growing up children.
c) Providing an adequate number of school dresses, shoes and books and other study material at free of cost till to the completion of secondary education to students coming from poor families.
d) Opening the new schools in the rural and marginalized areas which are underserved by the educational institutes so that children can easily reach to the schools. Special attention required to be given to River Island and river bank erosion-affected areas where drop-out rate is very high.
e) Regular appointment of well-qualified teachers with adequate female teachers in the school will increase the retention rate of particularly girls.
f) Removing loopholes in the implementation of RTE Act, 2009 which provide free and compulsory education to the children aged 6-14 years.
g) Providing monthly scholarship for the higher education to the girl children who are belonging to the BPL families.
h) Providing girls hostel at free of cost to girls belonging to poor families attached to each higher education institute.
i) Revamping the adult education and continuing education for illiterate and mere literate parents so that they can understand the value of education and encouraged to send their wards to the institution.

Besides these, every educated people should take some accountability for the expansion of women education to remove gender disparity at the grass root level.

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Annexure-I: Malda District: Block-wise gender Disparity Index, 2011

SL No.	Name of the Block	%age Share of Population to Total Population of the District			Disparity Index
		Muslim	SC	ST	
1	Harishchandrapur-I	59.41	24.60	2.08	0.115
2	Harishchandrapur-II	73.65	12.85	2.88	0.066
3	Chanchal-I	71.22	13.37	0.42	0.075
4	Chanchal-II	71.25	8.33	6.71	0.056
5	Ratua-I	66.88	11.09	8.52	0.087
6	Ratua-II	78.71	6.37	0.97	0.047
7	Manikchak	43.88	27.73	14.87	0.141
8	English Bazar	51.49	17.31	1.89	0.081
9	Old Malda	28.60	32.16	15.05	0.121
10	Habibpur	1.28	50.02	29.11	0.168
11	Bamangola	8.87	49.46	20.15	0.149
12	Gazole	23.60	37.36	19.94	0.138
13	Kaliachak-I	89.29	3.83	0.39	0.058
14	Kaliachak-II	65.98	15.56	2.29	0.096
15	Kaliachak-III	50.72	29.44	7.05	0.131
	Malda District	51.27	20.94	7.87	0.095

Source: Computed by authors based on Primary Census Abstract, 2011

Annexure-II: Block-wise Comparison of Gender Gap in Literacy of Total, Muslim, SC and ST Population, 2011

Sl. No.	C.D. Block		Gender Disparity in Literacy		
		Total	Muslim	Schedule Caste	Schedule Caste
1	Harishchandrapur-I	10.16	5.78	17.88	16.56
2	Harishchandrapur-II	5.98	2.09	16.68	21.37
3	Chanchal-I	7.54	5.58	15.93	22.32
4	Chanchal-II	5.31	0.38	16.72	21.75
5	Ratua-I	8.36	3.92	18.87	20.25
6	Ratua-II	4.33	1.50	16.39	19.95
7	Manikchak	13.29	9.13	16.41	18.61
8	English Bazar	8.08	4.51	13.09	9.81
9	Old Malda	11.59	-0.03	16.63	17.31
10	Habibpur	15.95	10.22	16.27	17.18
11	Bamangola	15.32	4.49	15.80	18.16
12	Gazole	13.66	5.38	16.71	16.92
13	Kaliachak-I	5.88	5.29	12.28	9.66
14	Kaliachak-II	9.67	6.81	17.64	19.44
15	Kaliachak-III	11.84	8.04	14.98	17.41
	Malda District	9.28	4.59	16.20	18.14

Source: Computed by authors based on Primary Census Abstract, 2011

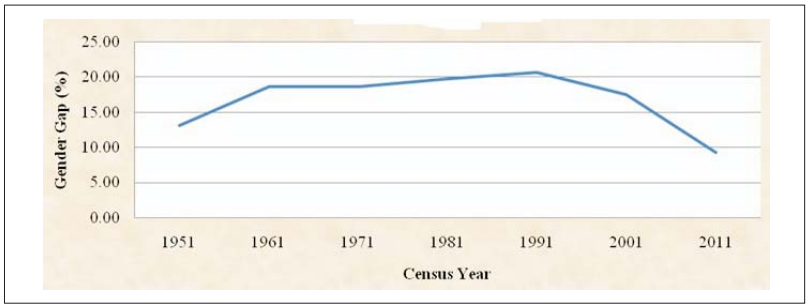

Fig. 1. Trends of the gender gap in literacy rate since 1951

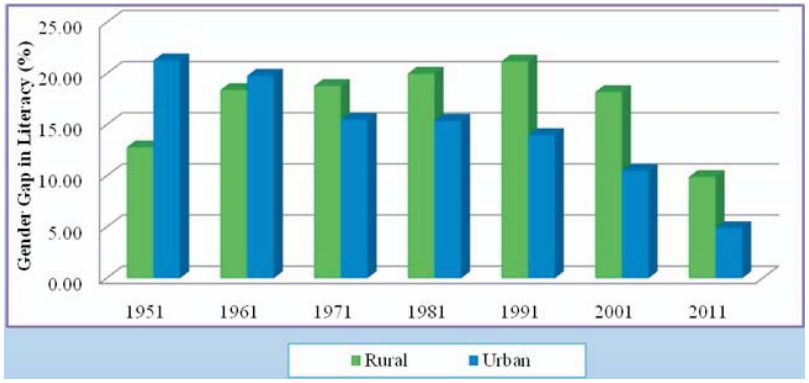

Fig. 2. Gender gap in literacy by residence during 1951-2011

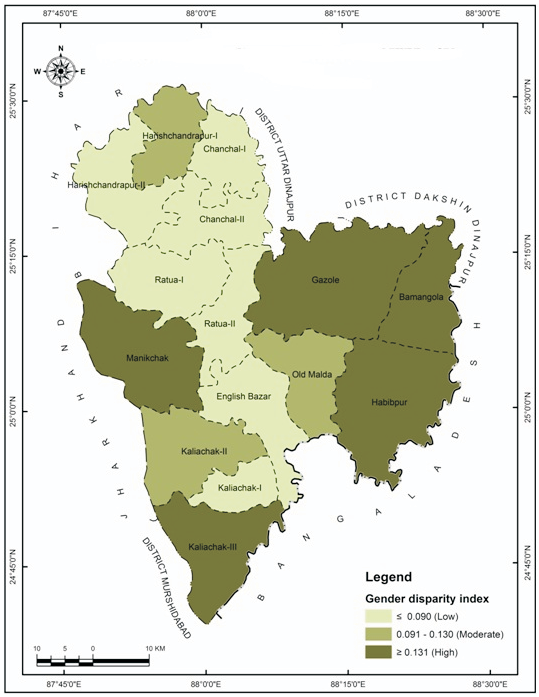

Fig. 3. Regional variations in gender disparity in literacy

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A Deep Learning based Air Quality Prediction Technique Using Influencing Pollutants of Neighboring Locations in Smart City

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Abstract: The level of air pollution in smart cities plays a critical role in the community's health and quality of life. Thus, air pollution forecasting would be beneficial and would guide citizens in avoiding exposure to dangerous emissions. The air health of a place can be diagnosed by close observation of the AQI (Air Quality Index) of that place. Moreover, the AQI of a place may have some influence on the pollutant concentration of the neighboring places. To address this issue, this work introduces a hybrid deep learning framework that is able to predict the values of a corresponding metric: AQI of smart cities. As a part of this work, two algorithms are proposed. The first one replaces the missing values in the dataset and the second one formulates the influence of the nearby places' pollutant concentrations on the air quality of a particular place. A deep learning-based forecasting model is also proposed by combining 1D-CNN and Bi-GRU. To test the applicability of the framework, a large-scale experiment is carried out with the real-world dataset collected from New South Wales, Australia. Experimental results validate that the proposed framework provides a stable forecasting result, it confirms that the AQI of a place gets affected by the pollutant concentration of the nearby places and the comparison of forecasting result with the existing state of the art models shows that the proposed model outperforms the other models.

Keywords: Smart city, Air quality, Prediction, Atmosphere, Deep learning
Categories: H.3.1, H.3.2, H.3.3, H.3.7, H.5.1
DOI: 10.3897/jucs.78884

1 Introduction

Modern urbanization and the smart city concept resulted in major dependency on advanced technologies to guarantee the quality of life to the citizens [Rouse, 2019]. There are several challenges that are to be faced every moment by the residents of smart cities. Some of them are like water pollution, lowering in water levels, polluted environment, noise pollution, security issues, and many more. Smart cities are the worst sufferers of air pollution which are caused by unrestricted industrialization as well as

A reference architecture for context-aware intelligent traffic management platforms

Rehena, Zeenat; Janssen, Marijn; Chattopadhya, Samiran

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LINKAGE FOR ACADEMIC COLLABORATION

Linkage for Academic Collaboration

This Academic Linkage is made and entered into force this **18th December, 2019**

Between

Dr. Abhijit Guha

Convenor, Ph.D. RAC, SVCMRES & Associate Professor
Department of Education
Ramakrishna Mission Sikshanamandira
P.O. Belur Math, Howrah- 711202, West Bengal **(First Party)**

And

Dr. Reshma Khatun

Assistant Professor
Department of Education,
Aliah University
Kolkata, West Bengal **(Second Party)**

1. INTRODUCTION

After detailed discussion, the first party and the second party chalked down the areas of cooperation in detail and agreed to provide research consultancy to the students / scholars in the field of Education. Both parties decided that an academic linkage will be of much help in this regard and agreed to establish an academic linkage.

Now both the parties agreed to establish the academic linkage with the following conditions

2. OBJECTIVES OF THE LINKAGE:

The Objectives of this Academic Linkage are as follows:

1. To provide academic support in research work in the field of education.

2. To held discussion, whenever necessary, for the purpose of setting and defining research problem.

3. To provide support in the task of literature review and to identify research gap for the research work.

4. To provide support in tool development and validation for research work.

5. To provide support in arranging data collection from academic institutions.

6. To provide support in data analysis and interpretation in research work.

3. RESPONSIBILITIES OF DR. ABHIJIT GUHA

1. As and when necessary, Dr. Reshma Khatun will communicate Dr. Abhijit Guha for the necessary consultation (as per mentioned areas in the objectives). Dr. Abhijit Guha will fix a schedule for the consultation as per convenience of both the parties. Both the parties will meet in the institution and necessary assistance will be given by Dr. Abhijit Guha to Dr. Dr. Reshma Khatun or her students/ scholars.
2. In case of review of research literatures, on the intimation regarding library work by Dr. Reshma Khatun necessary arrangement will be made by Dr. Abhijit Guha for the library work in his institution.
3. For tool validation, Dr. Reshma Khatun will send the tool with a forwarding letter to Dr. Abhijit Guha. On receiving the tool, Dr. Abhijit Guha will validate the tool and return back the validated tool having signed on it within 10-15 days to Dr. Reshma Khatun.
4. For the purpose of data collection, Dr. Abhijit Guha will provide support and arrange condition to collect data from his institution i.e. Ramakrishna Mission Sikshanamandira. He may also give necessary information and introduction to other places where from data can be collected.
5. In case of assistance for data analysis, tabulated raw data has to be provided by Dr. Reshma Khatun. After the analysis of the data, Dr. Abhijit Guha will provide the result (soft copy) and necessary meeting will be arranged by Dr. Abhijit Guha for the interpretations and discussion of the results.

4. RESPONSIBILITIES OF DR. RESHMA KHATUN

1. As and when necessary, Dr. Abhijit Guha will communicate Dr. Reshma Khatun for the necessary consultation (as per mentioned areas in the objectives). Dr. Reshma Khatun will fix a schedule for the consultation as per convenience of both the parties. Both the parties will meet in the institution and necessary assistance will be given by Dr. Reshma Khatun to Dr. Abhijit Guha or his students/ scholars.
2. In case of review of research literatures, on the intimation regarding library work by Dr. Abhijit Guha, necessary arrangement will be made by Dr. Reshma Khatun for the library work in her institution.
3. For tool validation, Dr. Abhijit Guha will send the tool with a forwarding letter to Dr. Reshma Khatun. On receiving the tool, Dr. Reshma Khatun will validate

the tool and return back the validated tool having signed on it within 10-15 days to Dr. Abhijit Guha.

4. For the purpose of data collection, Dr. Reshma Khatun will provide support and arrange condition to collect data from her institution i.e. Department of Education, Aliah University. She may also give necessary information and introduction to other places where from data can be collected.
5. In case of assistance for data analysis, tabulated raw data will be provided by Dr. Abhijit Guha. After the analysis of the data, Dr. Reshma Khatun will provide the result (soft copy) and necessary meeting will be arranged by Dr. Reshma Khatun for the interpretations and discussion of the results.

5. FINANCIAL ARRANGEMENTS

There is no financial obligation under this Linkage.

6. TERMINATION OF LINKAGE

This Linkage may be terminated by either of the parties forthwith if either Dr. Abhijit Guha or Dr. Reshma Khatun commits breach of any of the terms hereof and shall have failed to rectify such breach within thirty days of the notice.
In addition to the reasons for termination as set forth above, this Linkage may be terminated forthwith if either of Dr. Reshma Khatun and Dr. Abhijit Guha voluntarily or involuntarily enters into official dilution.

7. DURATION-

This Academic Linkage shall remain valid for a period of 5 years only from the date of signing the Linkage. After this 5 years' time period, this Linkage may be terminated or may be renewed after judging the then situation.

8. SETTLEMENT

Upon termination of the Linkage, all rights granted to and the obligations by Dr. Reshma Khatun and Dr. Abhijit Guha hereto, shall cease to exist forthwith.

9. AMENDMENTS TO THE LINKAGE

No amendment or modification of this Linkage shall be valid unless the same is made in writing by both Dr. Abhijit Guha and Dr. Reshma Khatun; to be an amendment of this Linkage. The modifications/ changes shall be effective, from the date on which they are made/executed; unless otherwise agreed to. In general, the Linkage will be amended on yearly basis, IF AT ALL REQUIRED, on mutually agreed terms.

LINKAGE FOR ACADEMIC COLLABORATION

10. SIGNATURE OF THE PARTIES

This Linkage has been executed in two originals, one of these has been retained by Dr. Abhijit Guha and the other has been retained by Dr. Reshma Khatun.
In witness whereof the parties hereto have signed this Linkage the day, month and year mentioned hereinbefore.

Institute	Ramakrishna Mission Sikshanamandira	Department of Education, Aliah University
Address	Belur Math Campus, Belur Math, Howrah, West Bengal 711202	9th Floor, Park Circus Campus, 17, Gora Chand Road, Kolkata-700 014.
Department	Department Education	Department of Education
Party	First Party	Second Party
Name	Dr. Abhijit Guha	Dr. Reshma Khatun
Designation	Convenor, Ph.D. RAC, SVCMRES & Associate Professor	Assistant Professor Department of Education, Aliah University
Signature with official seal & Date	18/12/2019 Dr. Abhijit Guha Associate Professor in Education Ramakrishna Mission Sikshanamandira (Autonomous Post Graduate College of Teacher Education) Belur Math, Howrah-711202	18/12/2019 Assistant Professor Department of Education Aliah University, Kolkata
Full Signatures of the witnesses	1. Assistant Professor 18/12/2019 Ramakrishna Mission Sikshanamandira A Post-Grad ... Autonomous College ... Education ... Howrah	1 16/12/2019 Assistant Professor Department of Education Aliah University, Kolkata
	2. Assistant Professor 2019 Ramakrishna Mission Sikshanamandira A Post-Graduate Autonomous College of Teacher Education Belur Math, Howrah	2. 18/12/19

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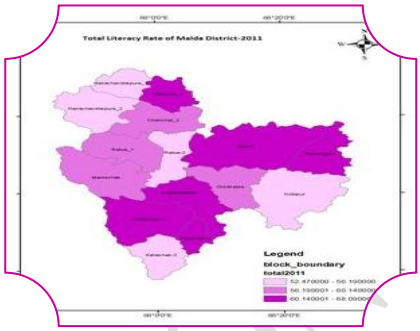
TRENDS AND SPATIAL PATTERNS IN POPULATION GROWTH OF MALDA DISTRICT: AN OVERVIEW



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ABSTRACT

Trends and patterns of population growth is a significant demographic study as it form essential part of socio-economic development planning. This paper is aimed to analyse the trends and spatial patterns of population growth of Malda District of West Bengal. This work is based on the various sources of secondary data such as Census of India, District Census Handbook, District Statistical Handbook etc. The growth rate of population is measured in terms of arithmetic rate of increase. It is observed from the study that the population of Malda District is increasing at an alarming rate and tends towards population explosion. The decadal growth rate of 1991-2001 and 2001-2011 of this district was higher than the state and national averages. As per 2011 Census, this district recorded second highest decadal growth rate in population in the state, however, the population growth rate is not uniform throughout the district. The block level analysis of population growth shows that the growth rate is highly uneven and also varies significantly between rural and urban areas. Moreover, differential in population growth is observed by religion in the district.

KEYWORDS: *Secondary data, Population growth, Population explosion, Arithmetic rate, Census, Decadal Growth Rate.*

INTRODUCTION

Traditionally Population Geographers in general and Demographers in particular are predominantly concerned with analysing trends and patterns of population growth. While doing so they are confronted with difficulties related to lack reliable of data on growth of population in consistent way over long period of time. The growth, pattern and the density of population during the pre-historic period is full of obscurities due to dearth of documentary evidences. The scholars, under duress, have dependency on the much unreliable circumstantial evidences to estimate the population and related information relevant for the period (Hassan, 2005). But after conducting the census at regular interval in different countries of the world, population geographers get the population related data very easily and made their contribution in social sciences effectively. We may easily analyze the spatio-temporal trends and pattern of population growth of Malda district of West Bengal very effectively.

RESEARCH PROBLEMS

Rapid population growth and resultant impacts on the public infrastructure is one of the basic problems observed in Malda district as the same can be found in the state as well as in the country as well. Population pressure can be very well witnessed in the form of illiteracy, unemployment and deficient amenities and services. The district occupies second rank in terms of population growth in the state with 21.24 per cent growth rate which is much higher than the state average of 13.84 per cent is a pertinent problem that attracts the attention of the researchers. That is why the research problem has been entitled as "**TRENDS AND SPATIAL PATTERNS IN POPULATION GROWTH OF MALDA DISTRICT: AN OVERVIEW".**

SIGNIFICANCE OF THE STUDY

There have been several rounds of misuse and misinterpretation of demographic data. The problem is such that demographic data is often used by politicians to meet a non-demographic end. Population growth has been a contentious issue for many years in India. It's so serious that 830 million populations are effectively convinced that they will soon be outnumbered by 130 million. Malda being a bordering district attract more attention of the demographer to study the phenomenon of population growth. Thus the present study would certainly help to clear some obscurity and to make better comprehension of population growth. Thus in this context the present study carries great significance.

SCOPE AND LIMITATIONS OF THE STUDY

It would be presumptuous to claim that all the explanations of population growth are flawless. The discussion and explanation is purely based on the secondary sources of the data. Therefore, any inaccuracy in the data leads may lead to incorrect explanation. This article makes an effort to discuss only the trends and spatial pattern of population growth and recommended the suggestions to arrest the rapid population growth in the district. Therefore, there is a further scope to identify the specific cause of population growth and measure the impacts of the determinants of the population growth such as fertility rate, age at marriage, education attainment, work participation rate especially female work participation rate, type of economy, and health facilities available etc to develop better comprehension of the phenomenon of rapid growth of population in the district. There may be further scope to assess not only scope for further study but also the implications of population pressure on the public infrastructure, amenities and services of the district due to rapid population growth.

BRIEF INTRODUCTION TO MALDA DISTRICT

Malda district is located between the North and South Bengal in the state of West Bengal. Before the creation of Jalpaiguri Division i.e. 4th March in 1963, the district was under Presidency Division (Census, 1961). The North-South extension of the district is between 24º 40' 20" N to 25º 32' 08"N and the longitudinal extension between 87º 45' 50"E to 88º28'10" E. The southern part of the district is surrounded by Murshidabad district across Ganga River, the east and the north-eastern part by Bangladesh and South Dinajpur, northern part by North Dinajpur District and the western part by the state of Bihar and Jharkhand (GoWB, 2007).

According to 2011 Census, Malda district covers an area of 3733 sq. km which shares 4.2 per cent of the total area of the state of West Bengal.The district consists of two sub-divisionsand fifteen C.D. blocks.Under the Malda Sadar sub-division there are nine C.D. blocks viz. English Bazar,Manikchak, Kaliachak-I, Kaliachak-II, Kaliachak-III, Gazole, Old Malda, Habibpur, Bamongolawhereas Chanchal sub-division composed of six C.D. blocks viz. Ratua-I, and Ratua-II, Chanchal-I, Chanchal-II, Harishchandrapur-I, Harishchandrapur-II, andIt is the home and permanently resting ground of 3988845 persons which shares 4.37 per cent of the total population in the state in which only 13.58 per cent urban population while 86.42 per cent reside in countryside. The sex ratio is 944 and the literacy rate is 61.73 per cent wherein male and female literacy is 66.24 and 56.96 per cent respectively (COI, 2011).

OBJECTIVES OF THE STUDY

The study is designed to achieve the following objectives-

- To examine the trends, since 1901 onward, and spatial pattern of population growth since 1991 of Malda District.
- To measure the differential population growth by residence (Rural-Urban) in the district.
- To find out some measures to arrest the rapid rate of population growth.

MATERIALS AND METHODS

The present paper is intended to analyse the trends and patterns of population growth as well as the differential population growth by religion of Malda District of West Bengal. The study is entirely based on secondary sources of data which has been collected and computed from Census of India, District Census Hand Book, District Statistical Handbook and District Human Development Report of Malda District. The population growth rate is measured in terms of **arithmetic rate of increase**. To complete this research paper, various books on demography and population studies, various unpublished research works has been studied. The collected data tabulated systematically and represented them by various maps and diagrams to draw the proper inference.

The arithmetic rate of growth in population between any two-time points would be:

$$R = (P_t - P_0)/P_0$$

Where, P_0 is the population at the base year, P_t is the population of the terminal year and R is the rate of population growth.

To examine the trends of population growth, the population growth of the district have been considered since 1901 where as for the block level analysis; the total population from 1991census to 2011 census have been taken into consideration.

For the analysis of differential growth rate of rural- urban population, only the growth rate of rural and urban population of the district since 1901 have been taken into consideration as all the blocks have not urban population and finally suggested some measures to arrest the rapid rate of population growth of the district.

Trends in Population Growth of Malda District (1901-2011)

Over the time and space the population of the district is changed. Malda district recorded highly fluctuate population over the periods of 110 years. According to 2011 census, the total population of Malda district is 3988845 which are more than six times than the population over 6 lakh in 1901.The decadal growth rate of population is highly fluctuated in these 110 years. So the demographic history of Malda in these 110 years can be categorized into following four distinct phases.

I. Period of stagnant population growth (1901-1921)
II. Period of slow and steady growth (1921-1951)
III. Period of rapid growth (1951-1991)
IV. Period of high but declining growth (1991-2011)

I. Period of Stagnant Population (1901-1921):

Table 1 provides the vivid picture of the trends in population growth of Malda during the last hundred and ten years. The decadal growth rate population remained very low till 1921, and in fact, the 1921 census recorded the negative growth rate of -1.77 per cent during 1911-21whichwas known as the decade of epidemic. Malaria and influenza epidemic caused the depletion of population in the district (Census, 1961). Thus, the first twenty years of the twentieth century, Malda witnessed only 13.95 percent growth rate in population.

II. Period of Slow and Steady Growth (1921-1951):

After 1921 census, the improved medical facilities control the epidemic of Malaria and influenza which accelerate the population growth of the district. The decadal growth rate of population increased from 4.99 per cent during 1921-1931 to over 17.19 per cent during 1931-1941 while during 1941-1951, the growth rate declined to 11.05 per cent which is due to the Great Famine of 1943 followed by the serious epidemic of 1944 resulted in decrease in the growth rate of population of the district Census, 1961).

III. Period of Rapid Growth (1951-1991):

The year 1951 indicates the beginning of rapid population growth in the district. Over a period of forty years i.e. 1951-1991, more than 17 lakh population added to the total population of district. After 1951, the population growth rate suddenly increased. It shot up abruptly to the high level of 30.33Per cent in 1951-1961and 31.98 Per cent in 1961-1971 decade. It was mainly because of steep fall in death rate and high fertility rate. Besides this, Malda district included the population of five *Tolas* (neighbourhood) of Govindpur mouza which was on the West Bengal-Bihar border (1961, Census). During 1961-1971, the highest growth rate was observed in the demographic history of the district.

Table 1
Malda District: Trend of Population Growth (1901-2011)

Census Year	Total Population	Growth Rate (Per cent)	Decade	Pace of Growth	Remarks
1901	603649	--	--	Stagnant Population	-
1911	698547	15.72	1901-1911		
1921	686174	-1.77	1911-1921		Negative
1931	720440	4.99	1921-1931	Slow but steady growth	
1941	844315	17.19	1931-1931		
1951	937580	11.05	1941-1951		
1961	1221923	30.33	1951-1961	Rapid Growth	
1971	1612657	31.98	1961-1971		Highest
1981	2031871	26.00	1971-1981		
1991	2637032	29.78	1981-1991		
2001	3290468	24.78	1991-2001	Slow Down	
2011	3988845	21.22	2001-2011		

Source: Authors' own calculation based on i) Census of India, 2011, West Bengal, Series-20, Part-XII-A, District Census Hand Book, Malda: Village and Town Directory p.43.andDistrict Statistical Hand Book, Malda, 2004, Government of West Bengal, (2007). Table, 2.3, p.12

The high population growth rate observed throughout the state as a whole and in many of its districts during this period. In these periods, the international borders played an important part for the first time to change the population composition of the district. Influx of refugee from the neighbouring Bangladesh (erstwhile East Pakistan) actually set the tune of high population growth in the district. The 1961 census alone recorded as high as 65000 immigrants in the study area and the wave of migration continues through sixties giving an extra impetus due to the liberation war of Bangladesh in 1971. The return migration of 1950s is also an important phenomenon in which the people who migrated to East Pakistan from Malda district returned causing growth of population in the district (Census, 1971).

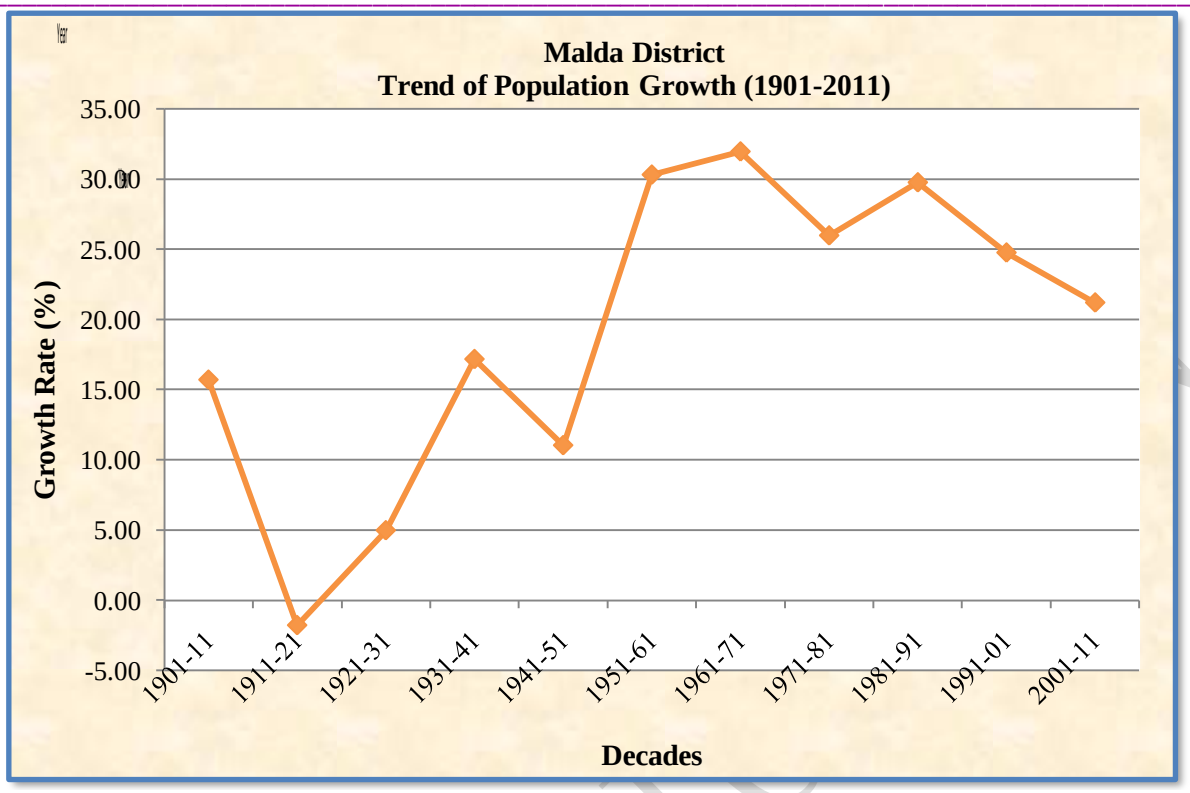

Figure 1: Trend of Population growth (1991-2011)

IV. Period of High but Declining Growth Rate (1991-2011):

After 1991 Census, Malda experienced high but declining decadal growth rate of population. The decadal growth rate of 1991-2001 and 2001-2011 were 24.78 per cent and 21.22 per cent respectively. During 1991-2001, the growth rate was down by 5 per cent where as during 2001-2011 this growth rate was down by 3.56 per cent in comparison to preceding decade. It is mainly because of the fact that the district's fertility and mortality rate has been declined.

Trend in Population Growth by Residence

It will be effective to examine the trend of population growth by residence. The table-2 represents rural-urban population in Malda district during 1901-2011. The district is mainly agrarian in nature. Most of the people reside in rural area. If we consider the 1901 year, 586239 (97.12 per cent) population out of 603649 were residing in the rural area whereas only 17410 (2.88 per cent) population were residing in urban area. The proportion of urban population decreased from 2.88 per cent in 1901 to 2.59 per cent in 1911. During this period i.e.1901-1911 the rural growth in population was 16.07 per cent whereas the urban growth was 3.80 per cent. But in the next decade i.e.1911-1921 the negative growth rate of -1.69 per cent and -4.81 per cent was observed in both rural and urban areas respectively. In the subsequent decades, high and fluctuating growth rate in population were recorded in both rural and urban areas of the district and the proportion of rural population were decreased while the proportion of urban population increased due to urbanisation. But the urbanisation rate is very slow as a result of which 86.42 per cent population are living in the countryside while that of urban area the corresponding figure is only 13.58 per cent. The highest rural growth rate of 31.89 per cent was recorded in the decade of 1961-1971 and in the subsequent decades the rural growth rate in population gradually declined except the decade of 1981-1991. The rural growth rate in population gradually declined because of the spread of education, consciousness of the masses, improved medical facilities and mainly for rural-urban migration.

Out of two municipalities in the district namely English Bazar and Old Malda, English Bazar Municipality has a great pulling effect over the rural population of the district and the population of neighbouring district. The basic amenities for the people is mainly concentrated in this municipality and that is why people are bound to migrate from rural to urban area to get the basic facilities. The last decade (2001-2011) has recorded an exorbitant urban population growth of 124.81 per cent in the district. It is mainly because of the problems of defining the urban area which is prescribed by the Indian Census 2011).

Table 2
Malda District: Decadal Growth Rate of Rural and Urban Population (1901-2011)

Census Year	Total Population	Rural Population	Urban Population	% of Rural Population	% of Urban Population	Decadal Growth Rate (%)	
						Rural	Urban
1901	603649	586239	17410	97.12	2.88	-	-
1911	698547	680475	18072	97.41	2.59	16.07	3.80
1921	686174	668972	17202	97.49	2.51	-1.69	-4.81
1931	720440	700754	19686	97.27	2.73	4.75	14.44
1941	844315	817136	27179	96.78	3.22	16.61	38.06
1951	937580	902419	35161	96.25	3.75	10.43	29.37
1961	1221923	1171138	50785	95.84	4.16	29.98	44.44
1971	1612657	1544631	68026	95.78	4.22	**31.89**	33.95
1981	2031871	1934675	97196	95.22	4.78	25.25	42.88
1991	2637032	2450495	186537	92.93	7.07	26.66	91.92
2001	3290468	3049528	240940	92.68	7.32	24.45	29.16
2011	3988845	3447185	541660	86.42	13.58	13.04	124.81

Source: Author's own calculation based on i) Census of India, 2011,West Bengal, Series-20, Part-XII-A, District Census Hand Book, Malda: Village and Town Directory p.43. andDistrict Statistical Hand Book, Malda, 2004, Government of West Bengal, (2007). Table,2.3, p.12.

According to the census definition, urban areas are comprised of two types of administrative units – Statutory Towns and Census Towns.

a) Statutory Towns: According to Indian Census, all the Municipal Corporation, Municipality, Cantonment Board, Notified Town Area Committee, Town Panchayat, Nagar Palika etc., are known as Statutory Towns.
b) Census Towns: Administrative units satisfying the following three criteria simultaneously are treated as Census Towns:
i) A minimum population size of 5,000 persons;
ii) 75 per cent and above of the male main working population should be engaged in non–agricultural activities; and
iii) A minimum density of population of at least 400 persons per km^2.

(COI, 2011, Meta data, p.2). According to the above criteria twenty seven (27) new census towns added to the district and huge number of population belong to the new census towns added to the total urban population of the district.

Spatial Pattern of Population Growth

It will be more useful to examine the trend in population growth by blocks of Malda district separately for last two decades (1991-2001 and 2001-2011). The table3 depicts the spatial pattern of population growth in Malda district for the last two decades. It is observed that the decadal growth rate in

population is not uniform throughout the district. For the easy understanding of spatial pattern of population growth, the district has been divided into three regions on the basis of population growth i.e. I. Areas of low growth rate, II. Areas of Moderate growth rate and III. Areas of High growth rate.

I. Areas of Low Growth Rate(≤20.50 per cent):

During 1991-2001 the district's average rate in population growth was 24.78 per cent but some C.D. blocks recorded lower rate in population growth. Only three blocks Old Malda (-1.31Per cent), Habibpur (11.53 Per cent) and Bamangola (18.29 Per cent) have recorded lower rate in population growth during this period. But during 2001-2011 there are six blocks which fall under this category. These blocks are Chanchal-I (17.53Per cent), Habibpur (12.28 Per cent), Bamangola, (13.09 Per cent), Old Malda (13.47 Per cent), Kaliachak-II (-.62Per cent), Gazole (16.67 Per cent). It is mentionable fact that Kaliachak-II recorded 29.01 per cent population growth during 1991-2001 while negative growth rate observed in this block during 2001-2011.Kaliachak-IIblock is devastated by recurring flood and shifting of river course as a perennial phenomenon and because of it many people from Kaliachak-II migrated to other parts of the district as well as to neighbouring districts. Moreover, in 2001, the population of 18 disputed villages (actually situated in Jharkhand) were enumerated as the population of Malda district (W.B.) in which 17 villages with more than 53999 populations were belong to Kaliachak-II(Census, 2001).

Table 3
Malda District: Regional Variations in Population Growth (1991-2011)

Sl. No.	CD Blocks	Total Population			Decadal Growth Rate (Per cent)	
		1991	2001	2011	1991-2001	2001-2011
1	Harishchandrapur-I	129829	162406	199493	25.09	22.84
2	Harishchandrapur-II	157077	198039	251345	26.08	26.92
3	Chanchal-I	143288	174204	204740	21.58	17.53
4	Chanchal-II	132697	165192	205333	24.49	24.30
5	Ratua-I	173655	217356	275388	25.17	26.70
6	Ratua-II	125762	160904	202080	27.94	25.59
7	Manikchak	177572	214127	269813	20.59	26.01
8	English Bazar	180434	226236	274627	25.38	21.39
9	Old Malda	132999	131255	156365	-1.31	19.13
10	Habibpur	168397	187650	210699	11.43	12.28
11	Bamangola	107579	127252	143906	18.29	13.09
12	Gazole	233139	294715	343830	26.41	16.67
13	Kaliachak-I	243787	310935	392517	27.54	26.24
14	Kaliachak-II	163871	211406	210105	29.01	-0.62
15	Kaliachak-III	214721	284376	359071	32.44	26.27
	English Bazar (M)	139204	161456	205521	15.99	27.29
	Old Malda (M)	13021	62959	84012	383.52	33.44
Malda District		**2637032**	**3290468**	**3988845**	**24.78**	**21.22**

Source: Author's own calculation based on i) Census of India, 2011,West Bengal, Series-20, Part-XII-A, District Census Hand Book, Malda: Village and Town Directory p.43. andDistrict Statistical Hand Book, Malda, 2004, Government of West Bengal, (2007). Table, 2.3, p.12.

II. Areas of Moderate Growth Rate (20.51-25.50 Per cent):

According to the decades of 1991-2001, six blocks like Harishchandrapur-I (25.09Per cent), Ratua-I (25.17Per cent), Chanchal-I (21.58Per cent), Chanchal-II(24.49Per cent), Manikchak (20.59Per cent), English Bazar (21.29Per cent) have recorded population growth between 20 per cent to 25 per cent while during 2001-2011 there are three blocks namely English Bazar (23.85Per cent), Chanchal-II (24.30Per cent), and Harishchandrapur-I (22.84Per cent). Being a Headquarter of the district English Bazar already saturated with its population which leads to moderate population growth. Similarly Chanchal-II and Harishchandrapur-I being home to purely agrarian society cannot afford to high growth rate.

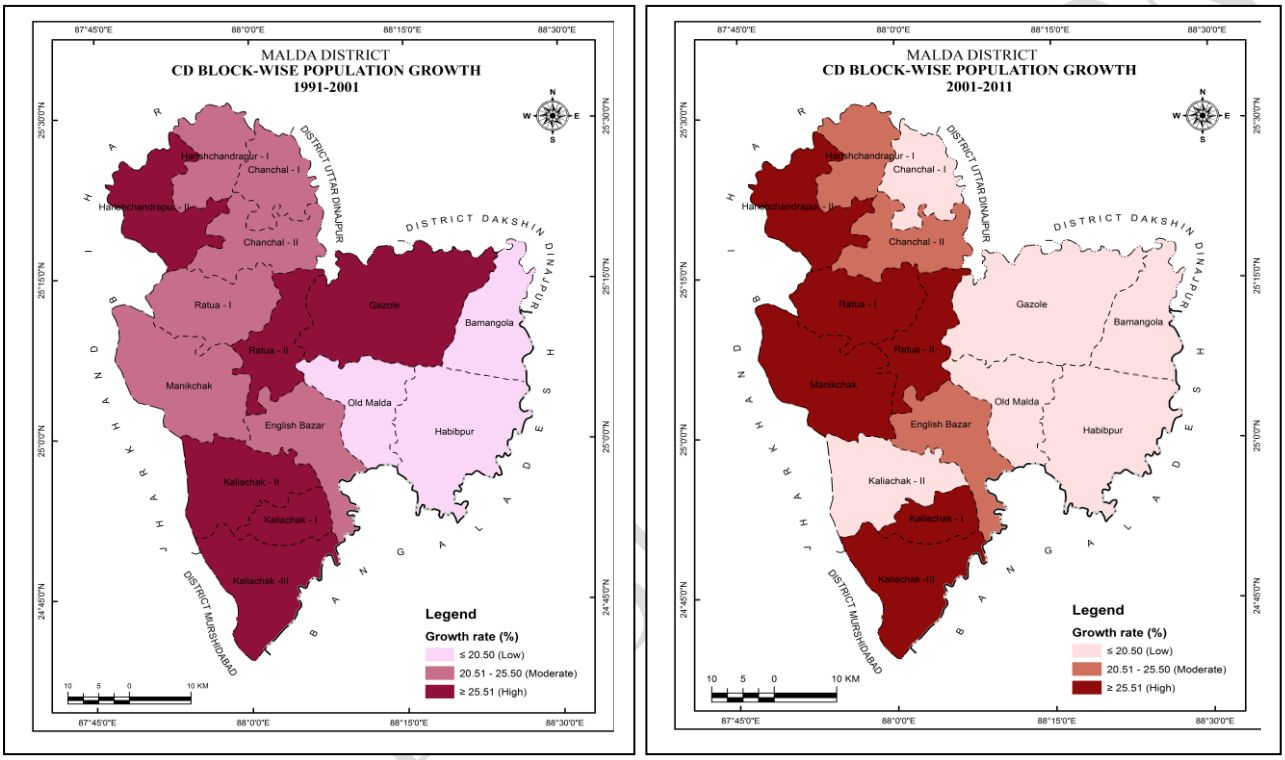

Figure 2: Regional Variation in Population Growth (1991-2011)

III. Areas of High Growth Rate (≥25.51 per cent):

During 1991-2011six blocks such as Harishchandrapur-II, Ratua-I, Ratua-II, Manikchak, Kaliachak-I and Kaliachak-III having the growth rate of 25.51 per cent or above fall under the areas of high growth rate. There are several reasons behind the higher growth rate of population in these blocks which have, extensive agricultural land, deep fertile alluvial soil, available source of irrigation facilities which increases the carrying capacity of the land hence support large number of population and agrarian families need large family so that they can do their agricultural activity by themselves. Besides these, mass ignorance, illiteracy especially female illiteracy and unawareness regarding negative impact of the population explosion arethe reasons behind the higher growth of population. Kaliachak-I is the developed block in terms of economic development. According to 2011 census, the eleven large settlements has been treated as Census Towns which have a great pulling effect over the rural population of neighbouring blocks due to new employment opportunities.

CONCLUSION AND SUGGESTIONS

From the preceding discussion on trends and spatial pattern of population growth in Malda district we may conclude that growth rate in population in Malda district is still quite high of 21.22 per cent as compare to stateand National's average of 13.84 and 17.70 per cent respectively according to the last decade (2001-2011). Though, it is the matter of satisfaction that the growth rate of population in Malda district is declined by 3.56 per cent points during the last decade (2001-2011) than the preceding decade (1991-2001). It is positive sign for the demography of Malda that the population growth rate started to decline from 1981census and the same is continued up to the last census i.e. 2011. In 10 out of 15 C.D. blocks a decline in growth rate oftheir population during 2001-2011 was recorded over the preceding decade. Though the overall growth rate in population in the district is continue to decline but in 6 out of 15 C.D. blocks was recorded more than 25 per cent decadal growth rate in the last decade and as a result of which about 6 lakh populations added to the total population of Malda district in the last census (COI, 2011). This rapid population growth and huge number of existing population exerts tremendous pressure on the public infrastructures and economy of the District that is why it is urgent need to arrest this rapid population growth for the present and the future benefit of the district.

The population of this district is rapidly increasing mainly due to high fertility and low mortality and to some extents due to immigration. If the wide gap between the fertility and mortality rate will bring down by the reduction of fertility rate, the rapid growth in population will be lowered and the number of population will be stabilized within a short period of time. The following measures will reduce the fertility rate hence the population growth of the district-

1) Illiteracy is the deep rooted problems in the district. Followed by the North Dinajpur (60.13Per cent) Malda district occupied last position in terms of literacy rate. The district's literacy rate is only 61.73 per cent wherein the male literacy 66.24 per cent and the corresponding figure for the females is only 56.96 per cent only. From the various literatures and survey we come to know that there is a negative correlation between the level of literacy and the number of births. So, illiteracy must be reduced from the district and for the eradication of illiteracy the state government and the district administration must implement the scheme of 'Sarva Shiksha Abhiyan(SSA)', 'Universalization of Elementary Education(UEE)' etc. properly.
2) The government should given emphasize on education especially on women education and the women must be learned about scientific knowledge of family planning.
3) National Family Planning Programme which is adopted by the Ministry of Health and Family Planning, Government of India, must be followed properly by the district administration of the Malda District.
4) Delay marriage should be promoted and it must not be less than 18 years and preferably 21 years for girls and 25 years for boys.
5) The unemployment is the basic problems of the district. According to 2011 Census, the average work participation rate in the district is only 38.55 per cent in which 26.35 per cent belongs to main worker while 12.21 per cent belongs to marginal worker. The female work participation rate is very poor. The average female work participation rate is only 23.30 per cent in which only 10.28 per cent treated as main worker and 76.70 per cent females are completely unemployed. The women must be encouraged for the participation in gainful economic activities.
6) Information and education campaigns regarding birth control measures, and small family norms should be organized at the grass root levels.
7) Universalization of the fertility regulation and diversification of health care providers is very essential.
8) More than 40 per cent people in the district belong to BPL category. Poverty is cause of malnutrition, hunger, deprivation, illiteracy, poor quality of life and consequent low level of human development. There is an inverse correlation between the standard of living and the fertility rate (Chandna, 2009). Therefore, initiatives should be taken to create new employment opportunities for the eradication of poverty.

9) Birth control depends upon the people's knowledge about birth control and the availability of contraceptives (Cox, 1976.). So, birth control contraceptives along with the birth control knowledge should be provided at free of cost at the village levels through the Sub-Health Centre (SHC), Block Primary Health Centre (BPHC) and Rural Hospitals.
10) The Self-Government institutions like Panchayats, Municipalities can take some accountability to arrest the rapid population growth by adopting various awareness programmes.

The combined effect of the above suggestions may be able to reduce the rapid growth of population of the district. Moreover, the awareness among the common people about the negative impact of population explosion and the implementation of strong population policy of the government can check the rapid population growth and population explosion.

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Disabilities and Learning Difficulties in the Spectrum of Special Education

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PREFACE

Special education encompasses a wide spectrum of disabilities and learning difficulties, each requiring specialized teaching approaches and support to help individuals reach their full potential. In special education, the Individualized Education Plan (IEP) is a crucial tool. It's a personalized document outlining a student's specific needs, goals, and the support they'll receive. Special education teachers and related service providers work collaboratively to implement strategies and accommodations tailored to each student's unique requirements. Inclusion is another important concept in special education, promoting the integration of students with disabilities into regular education classrooms whenever feasible, with appropriate support. The field of special education continues to evolve with research and advancements in teaching methods, assistive technology, and understanding of various disabilities. The goal is to provide all individuals with equitable opportunities to learn and succeed, regardless of their disabilities or learning difficulties.

For a long period, academics around the world have relied on the discipline specific system of generating and imparting knowledge. Special educational needs (SEN) and disability quite often, but not always, overlap and interconnect. Children and young people can have SEN but no disability and vice versa. While others may have both, which can mean they have complex needs. "A child or young person has SEN if they have a learning difficulty or disability which calls for special educational provision to be made for him or her. A child of compulsory school age or a young person has a learning difficulty or disability if he or she: has a significantly greater difficulty in learning than the majority of others of the same age or has a disability which prevents or hinders him or her from making use of facilities of a kind generally provided for others of the same age in mainstream schools or mainstream-post

institutions.". This book will set out to explain the relationship between disability and special educational needs bridging diverse communities of the humanities and social sciences.

Prof. (Dr.) Shauli Mukherjee
Mr. Amal Sankar Mukherjee
Mr. Pranay Pandey
Ms. Parama Kundu

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ISSUES AND CHALLENGES FACED BY STUDENTS WITH SPECIAL NEEDS IN INDIAN INCLUSIVE SCHOOLS

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Introduction

"All human beings are born free and equal in freedom and rights" and "recognition of the fundamental dignity and equal and inalienable rights of all members of the human family" is essential in today's world to realize the dream of an equitable modern society (UDHR, 1948). Differently-abled individuals, persons with disabilities, and even the disadvantaged and disadvantaged segment of our community are all examples of disability, which is a socially developed term. About differently-abled individuals, the world has various tales and the collective notions compel them to be socially persecuted and left uncared for, disregarded, and humiliated for no reason. Earlier it was thought that these people were the result of immoral deeds

done in their previous lives, and as a result of this belief, they had remained uncared for and treated as futile and disgraceful human beings for centuries. However, with the evolution of global socio-cultural and socio-political transformations, as well as the successful inclusion of human rights at national and international levels, multiple pathways have been created for ensuring equal dignity and inalienable rights for these individuals in society. People started coming forward with a fresh mentality to make this world also habitable for these people to live with equal rights and dignity, and helping them realize their dream through self-realization and actualization in the milieu of equipped available facilities in educational institutions. The international community, including India, opposes the inhumane treatment of disabled children and demands that they be permitted to live in an inclusive, democratic society with equal rights and dignity.

Education is recognized as a human right in the Universal Declaration of Human Rights, the United Nations General Assembly Charter, and the United Nations Convention on the Rights of the Child. The Universal Declaration of Human Rights (1948) asserted the absolute proclamation, defense, and promotion of these people's inalienable rights, and urged nations to make efforts to give equal rights and dignity to these people, as well as to take steps for their socioeconomic and sociopolitical upliftment. Furthermore, the Asian Human Rights Commission (1986) called for making laws that would allow these people to live their lives in their way, with equal rights and dignity. In this context, education has been widely regarded as an important way of realizing the dream, as it is the most influential tool for changing the world in terms of removing various forms of oppression as well as socially institutionalized prejudices and dogmatic beliefs (Mandela, 2014). It is seen as a source of hope for their overall well-being and advancement in society. It assists them in realizing their inherent potential and achieving their goals. There are numerous methodological viewpoints on educational initiatives, such as special education, integral education, and inclusive education towards mainstreams. And inclusive education is one of those, which is emerging and also emphasized in the New Education Policy, 2020. However, different reports and research studies provided evidence on the problems and challenges faced by students with special needs in the inclusive system of education (Mitiku et al., 2014; Suleymanov, 2015; Bhat & Geelani, 2017; Sharma, 2017; Parveen & Qounsar, 2018; Allam & Martin, 2021). This chapter provided theoretical

constructions of inclusive education and its conceptual distinctions between special education and integral education. It also endeavored to identify the issues and challenges faced by students with special needs in Indian inclusive education systems.

Approaches to Education for Students with Special Needs

In various socio-geo-strategic contexts, three different methodological approaches are being adopted to educate children with disabilities: special education, integral education, and inclusive education. These three main approaches are designed to help students with special needs in an enabling learning school environment where they can use their full ability to change their fate. Education up to date is considered one of the most vital interventions that have the potential to address the crisis faced by these children to maintain their everyday lives in a society parallel to the so-called normal human beings with equal rights and dignity. The educational institution is a social measure that helps to correct our society's defective behaviors and put them into the mainstream of human civilization.

Special Education

This was the prior definition of the predominant school system for autistic children. In India, it is an exclusive and institutionalized framework that has prevailed. Special education in an institutionalized residential education, which attempts to promote a learning environment for children with special needs in isolation in different schools built explicitly for these groups only, is seen in most cases. They are unable to attend a school for normal children in a natural environment. This style of education finds it impossible to provide disabled children with holistic learning opportunities, instead leading them to a life of social isolation and segregation. For educating these children with special needs, trained specialists and experts in special education are recruited to look after them and educate them. In India, there are many schools for people with disabilities exclusively designed for them. Presently, there are more than 3000 special schools for children with disabilities operating across the nation. Out of these, about 900 have institutions specifically for the deaf, 400 have institutions for the blind, 1000 have institutions for the mentally retarded, and the remaining 700 have facilities for children with physical disabilities (Vikaspedia, 2020). Such educational institutions develop a separate world of disabilities, as there are rare opportunities for special-need children to socialize with normal children in natural

settings. However, it has been playing a significant role in providing a platform for residential teaching-learning experiences and taking care of these socially disadvantaged people who once used to be considered as the expression of their sinful deeds committed in the past life and a sign of mishap to society.

Integral Education

Integral education is another methodological approach towards the education of children with disabilities that has arisen as a response to the segregated approach of institutionalized special education, which is specifically tailored for children with disabilities in an excluded atmosphere detached from the rest of society and would be supporting children's school-based comprehensive learning experience. In India, integral education refers to the inclusion of disabled children in regular schools with separate classrooms, teachers, and educational programs, as well as the unique opportunity to attend a few classes in typical classrooms with normal students. Also, it is often sensed as only the physical integration of these children with disabilities in schools without having provision for attending class with normal students in the same classroom. In the school climate, those students are taught in a separate classroom by teachers skilled in special education and have little enhancement in participatory learning with normal students in the same educational settings. This system is, of course, able to facilitate normal school learning experiences for students with disabilities. However, this approach finds it challenging to facilitate a holistic learning school experience for these children.

Inclusive Education

According to the National Education's Ministry Regulation (Ministry of National Education), "inclusive education is an educational system that provides opportunities for special needs and talented students to pursue education at mainstream schools along with other neuro-typical or 'normal' students." This methodological perspective of inclusive education has emerged as a strong stand for integral education and to the response of national and international human rights of equality, respect, dignity, and inalienable rights of all individuals. This approach offers the complete inclusion of children with special needs in normal schools in companion with normal students with the same teachers, instructional programs, and evaluation criteria in the same classroom. In this system, students

with disabled are allowed to live normal school participatory life and acquire both scholastic and co-scholastic school experiences along with normal social participation. It also attempts to facilitate a holistic learning experience for them, ensure they realize their potential, and boost the development of an integral personality in an inclusive setting.

Issues and Challenges to Inclusive Education

Children with disabilities are drawn into mainstream education through the inclusive education system. The road to achieving this inclusive education, however, is complex. The inclusion of children with disabilities in educational institutions does not guarantee a comprehensive learning experience. In India, students with special needs are permitted to enroll in regular schools under the constitutional provisions of the RCI Act of 1995 and the RTE Act of 2009. Although this has had some success, it does not guarantee that students with special needs will have a fitted school atmosphere appropriate for their educational needs. These children face a range of difficulties and challenges in multiple dimensions, such as social, academic, mental, and psychological, which hinder their full participation in school-based comprehensive learning experiences.

The thematic analysis brought out findings related to issues, problems, and challenges faced by children with special needs, which were grouped into different themes as follows:

Enrolment in Schools

The greater difficulty in trying to gain admission is faced by disabled children who want to attend inclusive schools. The majority of inclusive schools reportedly accept students with only modest disabilities. Also, they appreciate it when parents are prepared to shoulder more obligations for their wards. Another obstacle to admittance is parents' inability to pay costly tuition, especially in the case of private schools. The UDISE and UDISE+ data on enrolment showed persistently low and almost static enrolment of children with disabilities over the years. In 2013-14, the enrolment for children with disabilities in school education was 1.1 percent out of the total number of students enrolled. This declined to 0.9 percent in 2018-19, despite adding new impairment (Pandit, 2021).

Attitude of Teachers

Regular teachers usually possess two mindsets that influence their acceptance and dedication to adopting the inclusion of children with special needs (Oluremi, 2015; Gallego-Ortega & Rodríguez-Fuentes, 2021). First of all, regular teachers believed that trained teachers should handle students with impairments. Second, they considered children with impairments a "disturbance" in the classroom and 'the source of diversions' that prolonged the course length. As a result, they often decide to ignore them and concentrate instead on carrying out their instructional preparations, which are not based on individual-specific needs.

Classroom Size

The high teacher-student ratios in inclusive schools provide another difficulty. Usually, there are between fifty and sixty children in an average classroom. A teacher cannot manage such a large number of diverse students. With so many children, it becomes challenging for children to acclimatize, and sometimes children with special needs feel strange in a normal classroom (Zarghami & Schnellert, 2004; Arico, 2011; Bondebjerg et al., 2021).

Curriculum as a Barrier

The curriculum is one of the main barriers to developing an inclusive system in any educational system (Bhatnagar & Das, 2014; Hanreddy & Östlund, 2020). The curriculum in our country is not able to accommodate the needs of a wide variety of learners. It offers limited room for teachers to experiment with different teaching methods. The knowledge-based curriculum has resulted in exams that are too content-focused. This is another obstacle to evaluating the academic success of children with special needs.

Physical Infrastructures

Physical infrastructure is the primary concern of India's inclusive education system. It is a serious issue in inclusive education. Enrolling children with disabilities in school does not guarantee that they will have access to the necessary facilities for school accommodation and successful inclusion in regular classroom settings. It denoted structural transformation and change in existing institutions to equip all kinds of children. In this context, many initiatives were taken, such as Sarva Shiksha Abhiyan (SSA), Mid-Day Meal, Minimum Learning Level,

minimum level of available school infrastructure through Operation Blackboard; classroom, blackboard, books, drinking water facilities, and toilets, etc., and other necessary physical infrastructure. However, the current research has uncovered some serious issues and difficulties related to physical infrastructures, such as physical movement, motor skills, and the availability of various types of learning materials as well as learning-assisted devices and equipment.

Physical Movement or Free Motor

Physical movement, also known as the free motor, is a physical infrastructure issue that students with disabilities face, especially those who are orthopedically handicapped (legs) and, to some extent, blind. According to the findings, the institution has been suffering from the lack of a ramp or lift system for free and friendly movement inside the institution's premises. Also, there is an issue with organized sitting habits in the classroom; for example, children with hearing disabilities or low vision may have benefited from special arrangements in formal classrooms and the availability of a whiteboard for greater feasibility and visibility. Also, due to a lack of effort and support from schools, students often observe challenges in getting from home to school and vice versa. Students lack the tools and knowledge required to engage in community events and cultural school activities.

Unavailability of Learning Materials

Learning materials of various styles, formats, and learning-assisted audio-visual devices that are essential for the successful learning of students with disabilities in today's educational institutions are in short supply. The study discovered an acute scarcity of learning materials and audio-visual learning-assisted devices, such as Braille and figure printed books for the blind, as well as audio and visual infrastructural issues for blind and hearing-impaired children in an inclusive education system. The availability of audio or audio-visual lectures for blind and deaf students is lacking in many institutions.

Untrained Teachers

According to the report, there is a severe shortage of qualified and well-trained educators who are capable of teaching in an inclusive classroom system. And as a result of a lack of expertise and experience, preparation is inadequate and ineffective in developing classroom instructional programs and strategic methodologies that enable

students to experience classroom teaching. It was also revealed that there is often a lack of needed teachers, especially in special education, as well as a lack of handwriting for blind and orthopedically handicapped students (Sharma & Deppeler, 2005; Bhatnagar & Das, 2014; Mprah et al., 2015).

Social Acceptance and Emotional Adjustment

According to the findings of the research, students with disabilities have been reporting cases of bullying at school regularly (Wiener, 2002; Martínez & Semrud-Clikeman, 2004; Odom et al., 2006). They are often denied access to peer groups or inclusive social interaction. Owing to not-so-comfortable socio-economic and socio-learning school settings, students with disabilities have developed mental health issues such as depression, stress, and anxiety. It has been identified that the existing educational framework does not encourage an atmosphere conducive to inclusive education for students with various types of disabilities.

Peer Pressure

Since they are closest to one another, peers at school significantly impact the lives of children with disabilities (Thompson et al., 1994; Luciano & Savage, 2007). Children who have impairments are frequently targeted for bullying and teasing by their peers. All kinds of disabilities share this susceptibility to bullying. As a result, a key obstacle to full social participation at school for students with impairments is a negative peer attitude.

Discrimination and Social Marginalization

Due to widely held beliefs that educating people with disabilities is pointless and fruitless, disabled individuals are socially shunned by non-disabled people in inclusive settings. Many people are marginalized due to other factors like caste, gender, and poverty. Negative perceptions and social exclusion lead to social prejudice, which breeds isolation and creates barriers to the inclusion of children with special needs (Bakhshi et al., 2017; Priyanka & Samia, 2018).

Economic and Moral Support

Due to financial constraints, students with disabilities suffer mentally and do not make an effort to stay in school, according to the study (Kalyanpur, 2008; Ahmad, 2012; Das & Shah, 2014). They struggle to obtain the necessities for their survival and to maintain a

regular school schedule. It is also reported that they have moral support only by name. It has been repeatedly reported that schools are not responsible for providing financial support for these children, with the government only providing a small amount that is insufficient to cover their needs for motor movement and learning aids.

Constraint of Resources

Inclusion faces significant obstacles due to a lack of sufficient financial resources. Every school would need to make financial arrangements to provide amenities like elevators, ramps, barrier-free classrooms, restrooms, etc., to be included. Motion sensors for flushing toilets, automatic door buttons for opening doors, and other forms of technology may be used. For those with disabilities, learning resources would need to be developed. This could take the shape of a digital library, braille books, and other visual resources for pupils with hearing impairments, among other things. Additionally, financial resources would be needed to retrain and certify instructors to teach students with disabilities in inclusive classrooms. To do this, the government will need to raise its education budget to provide inclusive environments.

Organization and Governance

To equip institutions with an inclusive educational system, organization and governance of leadership and managerial skills and competencies of institutions and responsible personnel play a critical role in making infrastructures available, as well as class arrangement competencies and individualized instructional programs. According to the findings, engaged institutional personnel are not well-versed and competent in this area. Similarly, numerous comprehensive and serious issues and challenges relate to various aspects of physical infrastructures, the availability of resourceful, competent educators, social acceptance and emotional stability, moral support, and organizational and governance in an educational institution. On the other hand, a diligent attempt was consciously made for the inclusive education system through constitutional provision, constituted committees and commissions, and their recommendations. They diligently intended to realize the dream of effectively including children with disabilities in India. However, there is still a need for a new perspective on putting initiatives into action on the ground to have an effective outcome to the related problems and challenges.

Discussions

The current research has revealed three different approaches for educating children with special needs, namely special education, integral education, and inclusive education, focusing on each system's constructs, strengths, and weaknesses. It highlighted differences between applied policies in the form of rules, regulations, policy, and services and their realistic approach to addressing problems and challenges children with special needs face. Aside from promoting an analytical expatiation on issues, obstacles, and programs, the study found that while the formulated laws guarantee enrollment of students with special needs in public schools, they do not guarantee full inclusion and fail to facilitate a comprehensive school-based learning experience. Children with special needs have the same right to live in dignity as other children. A diligent effort must be taken to uplift these children through education. The study identified several challenges and issues faced by children with special needs, which include enrolment, attitude of regular teachers, classroom size, faulty curriculum, dearth of physical infrastructure, unavailability of learning materials, untrained instructors, emotional adjustment, peer pressure, bullying, social marginalization, economic constraint, etc.

According to Paul Feirre, a Brazilian Educationist, "Education either functions as an instrument which is used to facilitate the integration of the younger generation into the logic of the present system and bring about conformity, or it becomes the practice of freedom, the means by which men and women deal critically and creatively with reality and discover how to participate in the transformation of their world." To promote such a system, educational institutions must collaborate with other responsible stakeholders and provide the required infrastructures, professional educators, and learning resources. Students with special needs should be encouraged to participate in socio-cultural school events in schools. There must be an opportunity for them to receive financial assistance from the government and non-governmental organizations. Different faculty development programs, curriculum modifications, and pre-service and in-service teacher training should be focused on catering to individual learners' needs. While keeping all these in mind, attempts may be made to inculcate socio-cultural and democratic values amongst all students in schools. Special education and inclusive education must be integrated into pre-and in-service teacher training programs as compulsory. Besides, teachers must be trained in basic skills and competencies to equip them well in inclusive school settings.

Conclusion

The present study brought an evolving backdrop of an inclusive education system for children with special needs. It underlined the different types of education, which are special education, integral education, and inclusive education, with their respective pros and cons. The issues and challenges faced by students with special needs have also been identified with supportive studies, which may help responsible stakeholders to locate specific problems and thereby help them to minimize those identified problems. Based on the findings, it is suggested that the institutions should make every effort to alter and improve them to ensure that the current physical facilities are barrier-free and thus easily accessible to all students. Also, governments and policy-makers need to develop feasible educational policies for regular students and those with learning disabilities. Raising awareness of the status quo of children with special needs and establishing collaboration between parents and teachers in particular needs to be strengthened among all interested parties.

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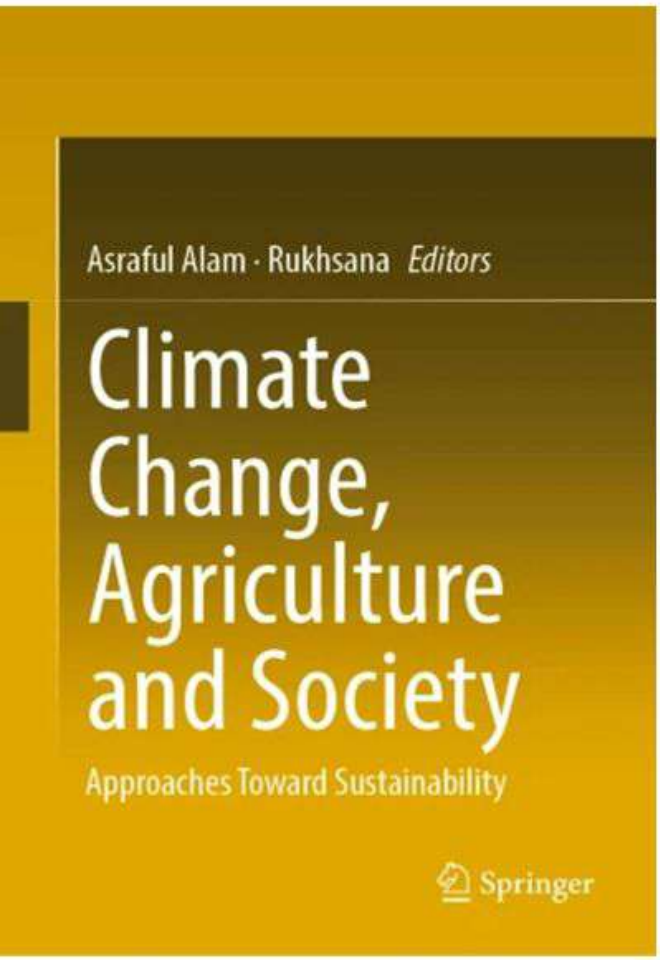

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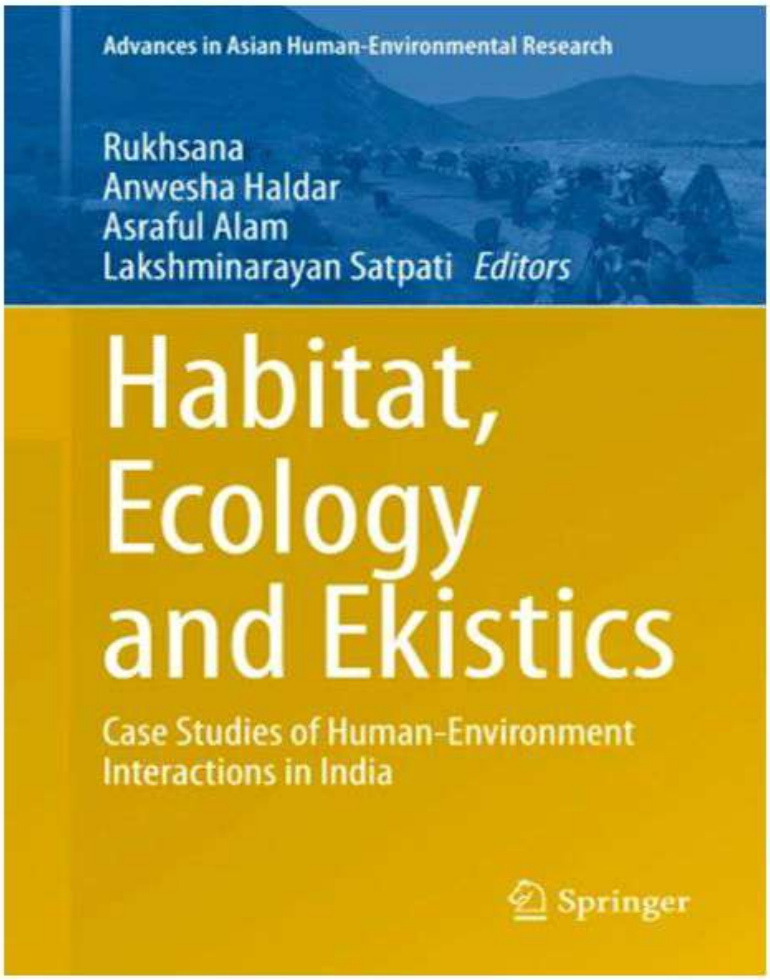

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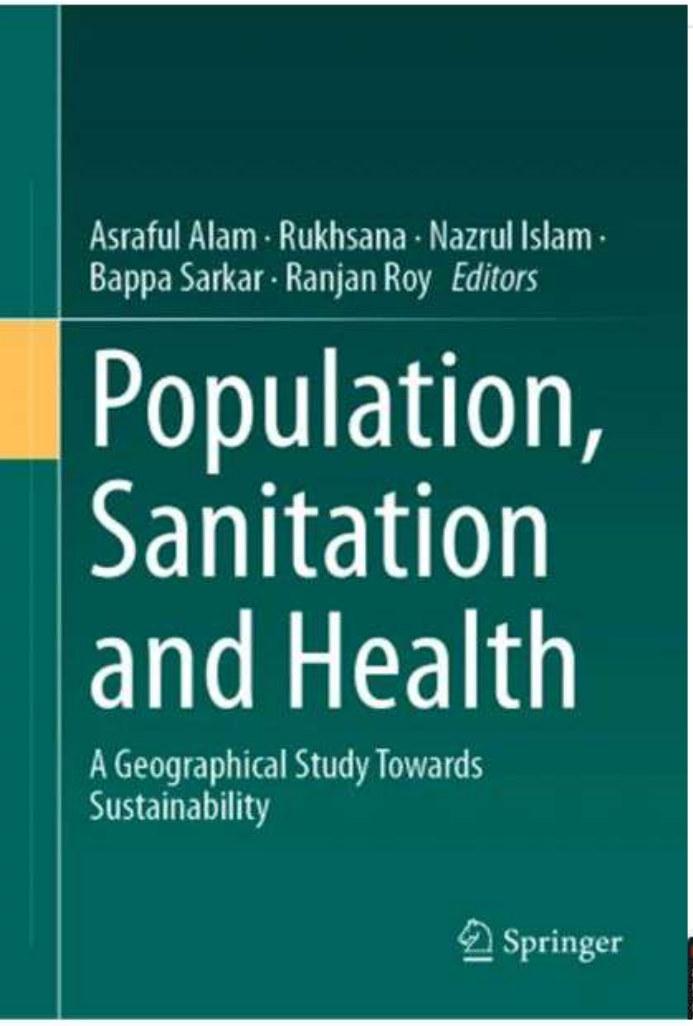

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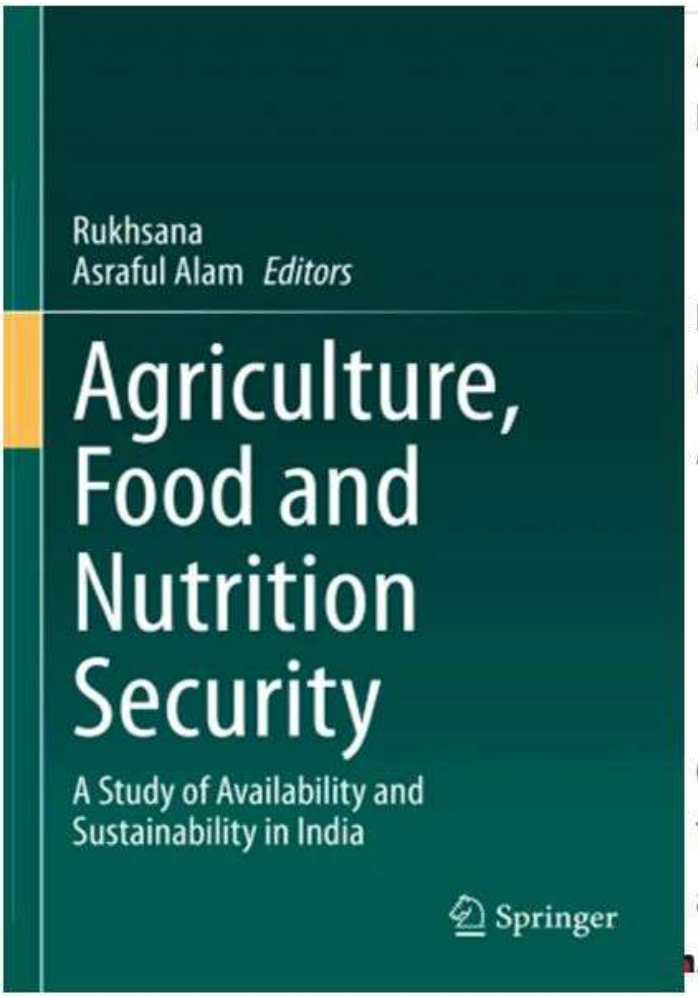

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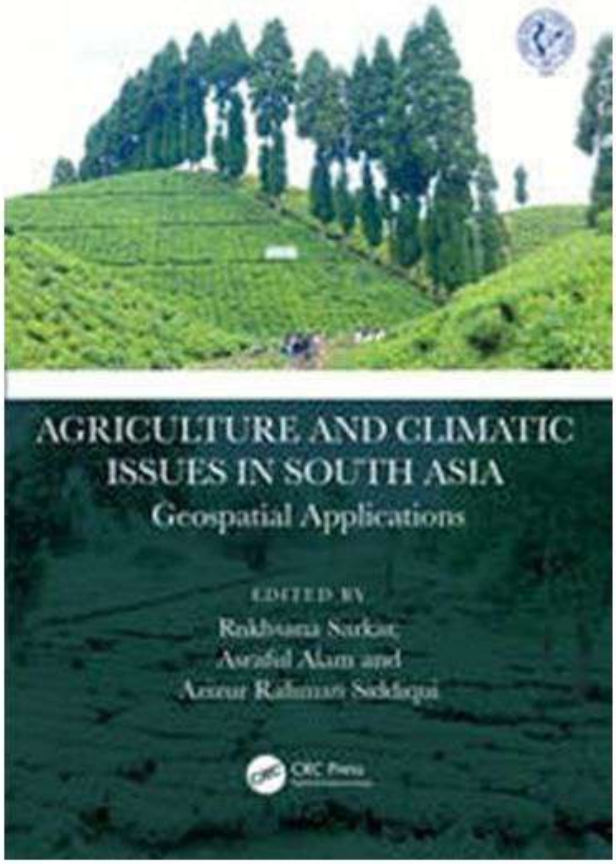

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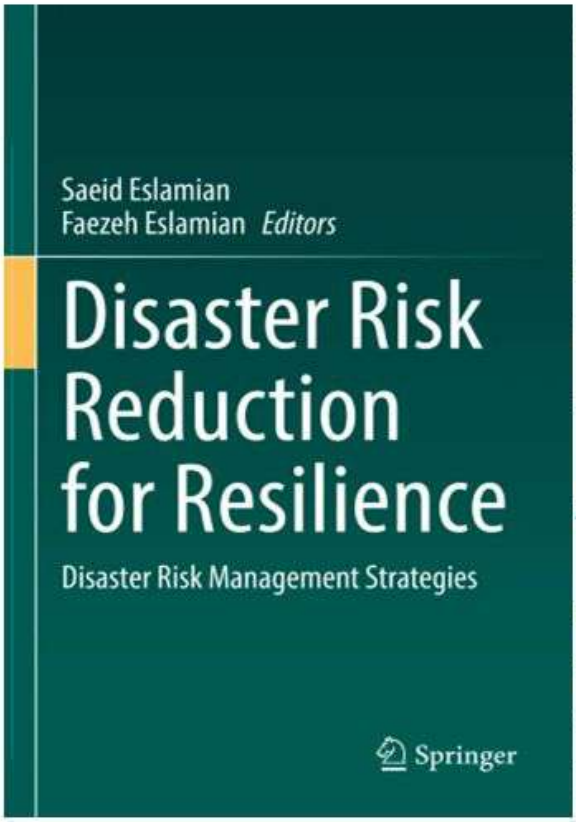

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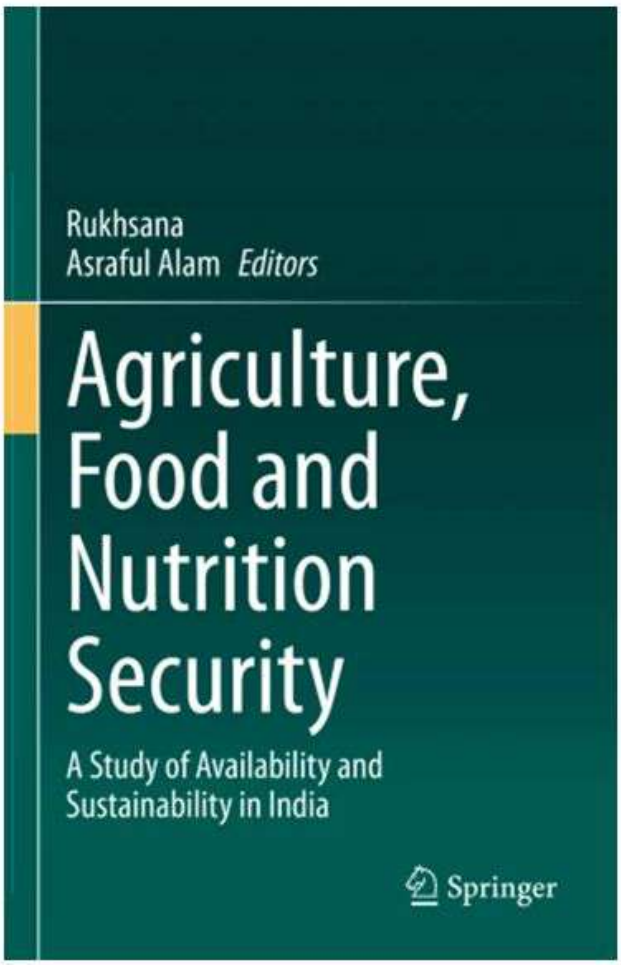

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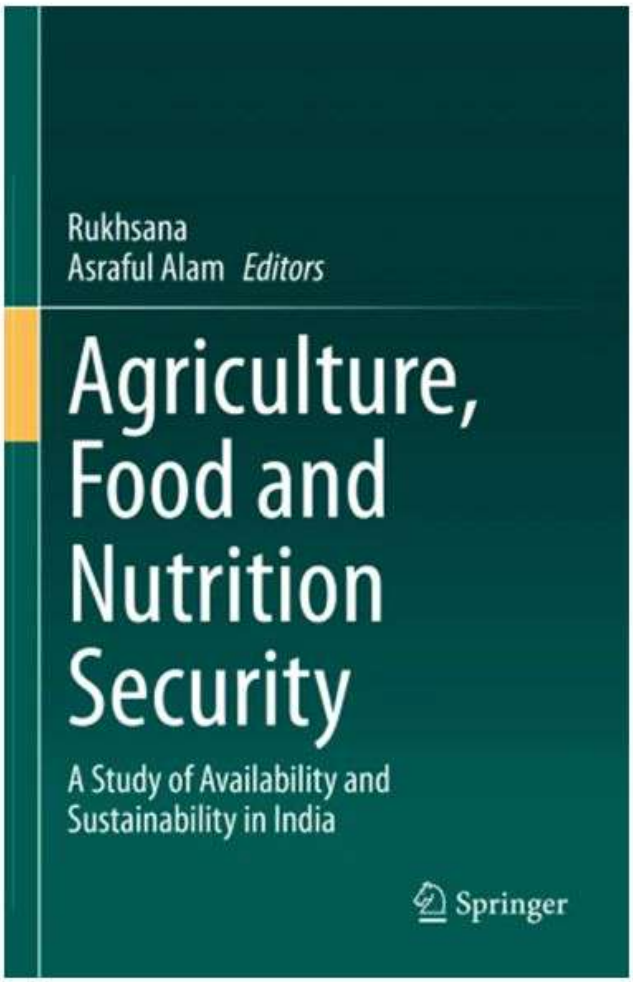

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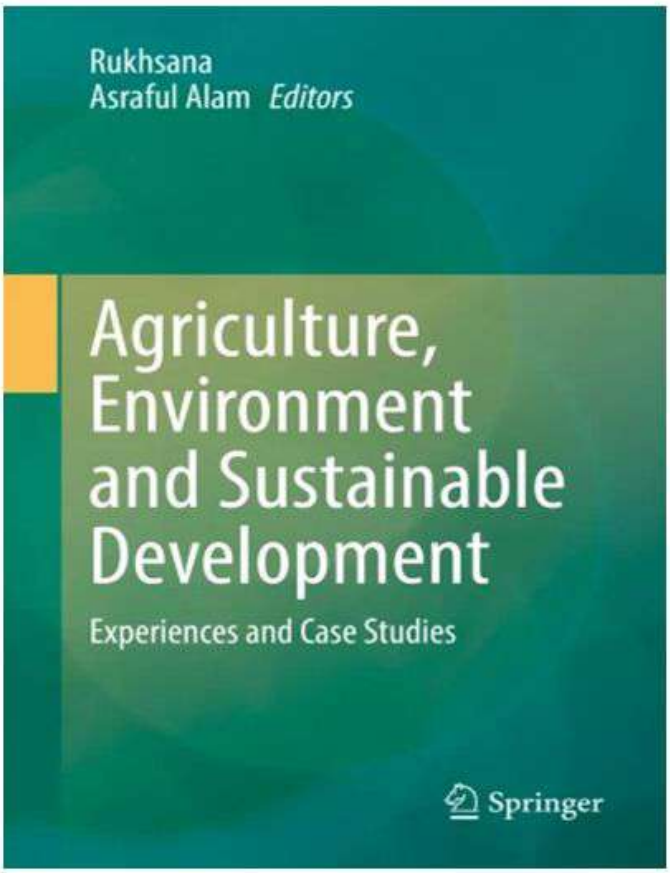

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A Two Day Workshop

On

Elementary Linguistics and Training on Language Documentation

Organized

By

Department of English, Aliah University

In Collaboration with

School of Languages and Linguistics, Jadavpur University, Kolkata

April 5-6, 2019

Venue: Department of English, Aliah University (Park Circus Campus)

Certificate of Participation

This is to certify that Mr./Ms.....

of the department of..... Participated in the workshop

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Sharmistha C Sriwastav	Safiul Islam	Atanu Saha	Bornini Lahiri
Head, Dept of English	Convener	Course Coordinator	

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