Volume 4, Issue 11. February 2017

ISSN 2320-7973

IJFAR

International Journal Of Fundamental & Applied Research

Editorial Board

Content

International Journal of Fundamental & Applied Research
Website : www.ijfar.org , ISSN- 2320-7973 Volume-4 Issue-11,Month – February 2017 pp.(01 – 03)

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सुषमा शर्मा प्रियंका गहलोत

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''गृह विज्ञान एक अंतर्विषयक क्षेत्र है, जिसमें कई विषय शामिल है। जैसे रसायन विज्ञान, भौतिकी, शरीरविज्ञान, जीवविज्ञान, स्वास्थ्य, अर्थशास्त्र, बाल विकास, खाद्य एवं पोषण, कपडा एवं परिधान डिजाइन, संसाधन प्रबंध तथा संचार आदि। गृह विज्ञान का उद्देश्य नित्य परिवर्तनशील समाज में घर सामाजिक तथा पारिवारिक जीवन के कल्याण और स्वास्थ्य को बनाए रखना है । गृह प्रबंध मे कौशल एवं वैज्ञानिक ज्ञान अपेक्षित होता है, जो मात्र घर के कार्यकलापों तक सीमित नहीं रहता, बल्कि यह चुनौतीपूर्ण व्यवसाय का आधार भी बनता है । गृह विज्ञान से ही यह भी ज्ञान प्राप्त होना है कि समय, धन, ऊर्जा का उपयोग किस प्रकार किया जाए। साथ ही गृह विज्ञान विषय से ही खाद्य, पहनावा, स्वास्थ्य, शिक्षा, मनोरंजन उपलृब्ध कराने की योजना, विवेकपूर्ण ढंग से बनाने का ज्ञान भी प्राप्त होता है । गृह विज्ञान एक शैक्षिक विषय है, जो नितांत रूप से छात्राओं को प्रिय है।

ifjp;

गृह विज्ञान से स्पष्ट है कि ''गृह का विज्ञान '' अर्थात गृह की सम्पूर्ण व्यवस्था करना। हमारे देश मे गृह के बिना व्यक्ति की कल्पना नही की जा सकती, क्योकि घर मे ही अर्थात परिवार मे ही बालक जन्म लेता है तथा वहीं उसके सम्पूर्ण व्यक्तित्व का विकास होता है। आमतौर पर लोग समझते हैं कि गृह विज्ञान घर की देखभाल और घरेलु साज– सज्जा का विषय है, लेकिन ऐसा समझना आशिंक रूप से सत्य है। गृह विज्ञान का क्षेत्र काफी विस्तृत एवं विविधता भरा है। इनका दायरा घर की सीमा से कही आगे तक निकल जाता है। यह एक ऐसा विषय है जो छात्राओं को उनके जीवन के दो महत्वपूर्ण लक्ष्यों के लिए तैयार करता है। घर तथा परिवार की देखभाल और अपने जीवन मे कैरियर अथवा पैशे के लिए तैयारी। आजकल महिला तथा पुरूष दोनों ही घर तथा परिवार की जिम्मेदारी समान रूप से निभाते हैं तथा अपने जीवन को सुखमय बनाने के लिए उपलब्ध संसाधनों का बेहतर उपयोग करने की कला सिखाता है। गृह विज्ञान आपको संसाधनों के प्रभावशाली प्रबंधन की कला, घर को स्वस्थ्य तथा सानंद बनाए रखने और आवश्यकता पड़ने पर एक सफल कैरियर के चुनाव मे आपकी मदद करता है । विज्ञान और कला का यह समन्वय आपके जीवन के हर क्षेत्र में काम आता है ।

घर, जिसमें आप रहते हैं।
भोजन, जो आप खाते हैं।
वस्त्र, जो आप पहनते हैं।
परिवार, जिसकी आप देखभाल करते हैं।
वातावरण, जो आपके आसपास हैं।
दक्षता, जो एक सफल कैरियर के लिए आवश्यक है ।

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आज छात्राएँ अपनी पढ़ाई या जीवन–वृत्त का चयन नहीं कर सकती। किसी व्यवसाय में स्थापना के लिए शिक्षा तथा प्रशिक्षण की आवश्यकता होती है। शिक्षा एवं प्रशिक्षण की जानकारी प्रत्येक व्यक्ति मे होना चाहिए। इसके लिए कैरियर निर्देशन केन्द्रों की स्थापना की जानी चाहिए। आज समाज मे अधिक परिवर्तन हो गया है। प्रत्येक युवती अपने जीवन वृत्त के संबंध अधिक जागरूक है। इसलिए आज समाज राष्ट्र तथा विद्यालयों का उत्तरदायित्व है कि उन्हे रोजगार के संबंध मे सूचनाएँ दी जाय और उनके रोजगार के चयन में सहायता प्रदान की जाए। गृह विज्ञान मे कई विषय है जैसे :–

1. आहार एवं पोषण
2. संसाधन प्रबंध

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3. मानव विकास
4. वस्त्र विज्ञान
5. प्रसार एवं संचार

आज यह विज्ञान इतना विकसित हो चुका है कि इसके प्रत्येक अंग के अपने उप–विभाग है और सभी विभागों मे छात्राएँ अपना केरियर बना सकती है। यदि छात्राओं को गृह विज्ञान से जुड़े सभी विषयों मे कैरियर निर्देशन दिया जाए, तो छात्राएँ अपने व्यवसाय तथा रोजगार प्राप्त करने मे सफल हो सकती है । विद्यालय स्तर पर छात्राओं की प्रतिभाओं की पहचान की जाए और महाविद्यालय के बाद ही सही कैरियर चुन कर छात्राएँ व्यवसाय के प्रति जागरूक हो जाए ।

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प्रस्तुत अध्ययन का निम्न उद्देश्य था–
''महाविद्यालय की गृह विज्ञान विभाग की छात्राओं मे कैरियर से सम्बंधित जागरूकता का अध्ययन करना ''

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प्रस्तुत अध्ययन की परिकल्पना थी –
महाविद्यालय की गृह विज्ञान विभाग की छात्राएँ कैरियर की प्रति जागरूक होगी ।

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प्रस्तुत अध्ययन की समष्टि माता जीजाबाई कन्या महाविद्यालय की गृह विज्ञान विभाग की किशोरी छात्राएँ थी। इन छात्राओं की समष्टि मे से न्यादर्श के रूप में उद्देश्यपरक न्यादर्शन के द्वारा 50 छात्राओं का चयन किया गया। इन छात्राओं की उम्र 16–22 वर्ष के मध्य थी। इन विद्यार्थियों मे शहरी एवं ग्रामीण दोनों आवासीय पृष्ठभूमि वाले विद्यार्थी शामिल थे । इनकी सामाजिक–आर्थिक स्थिति काफी हद तक एक जैसी थी।

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प्रस्तुत अध्ययन हेतु महाविद्यालय की गृह विज्ञान विभाग की छात्राएँ की कैरियर के प्रति जागरूकता चर से संबंधित प्रदत्त एकत्रित किए गए। इन चर के आकलन हेतु शोधक द्वारा एक स्व.निर्मित प्रश्नावली का उपयोग किया गया। इस प्रश्नावली में कुल 25 प्रश्न थे। प्रत्येक प्रश्न के सामने दो विकल्प थे– 'हाँ' एवं 'नहीं'। इन दो विकल्पों में से किसी एक विकल्प पर अनुक्रिया कर छात्राओं को अपने उत्तर देने थे। प्रश्नावली को हल करने हेतु छात्राओं को 30 मिनट का समय दिया गया।

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सर्वप्रथम न्यादर्श हेतु चयनित महाविद्यालय के प्राचार्य महोदय से शोध कार्य हेतु अनुमति ली गयी। न्यादर्श की संख्या अनुरूप शोध के चर के आकलन हेतु आवश्यक जागरूकता प्रश्नावली की छायाप्रतियाँ प्राप्त कर ली गयी। इसके पश्चात् चयनित विद्यार्थियों को मौखिक रूप से दिशा–निर्देश देकर अध्ययन का उद्देश्य स्पष्ट किया गया। न्यादर्श हेतु चयनित छात्राओं को कैरियर जागरूकता प्रश्नावली भरने को दी गयी। अन्त में प्रश्नावली को एकत्र कर प्रश्नावली पर अंक प्रदान किए गए। इस प्रकार महाविद्यालय की गृह विज्ञान विभाग की छात्राएँ की कैरियर के प्रति जागरूकता चर के लिए प्रदत्त एकत्र किए गए।

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प्रस्तुत शोध कार्य हेतु महाविद्यालय की गृह विज्ञान विभाग की छात्राएँ की कैरियर के प्रति जागरूकता के अध्ययन हेतु ifr'kr eku का उपयोग किया गया।

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प्रस्तुत शोध अध्ययन से निम्न परिणाम प्राप्त हुए–

1. 'अपने लक्ष्य से संबंधित आवश्यक कौशल प्राप्त करने के लिए आपने कोई प्रशिक्षण अथवा डिप्लोमा या अन्य कोई साधन अपनाया है' यह गृह विज्ञान की छात्राओं से पुछने पर 79 प्रतिशत छात्राओं ने हाँ उत्तर दिया व 21 प्रतिशत छात्राओं ने नहीं उत्तर दिया। इससे ज्ञात होता है कि लक्ष्य से संबंधित आवश्यक कौशल प्राप्त करने के लिए अधिकांश ने प्रशिक्षण अपनाया है। छात्राएँ केरियर मार्गदर्शन को आवश्यक समझती है।
2. कुल 90 प्रतिशत छात्राएँ इस बात से सहमत है कि कैरियर निर्माण आज युग की माँग है। इससे ज्ञात होता है कि छात्राएँ कैरियर निर्माण के लिए जागरूक है ।
3. कैरियर निर्माण से संबंधित भविष्य की योजना बनाने के संबंध मे 78 प्रतिशत छात्राओं ने सहमति जतायी, जिससे कैरियर निर्माण से संबंधित भविष्य की योजना बनाने के संबंध में उनकी जागरूकता का ज्ञान होता है ।
4. महाविद्यालय के कैरियर निर्देशन विभाग की जानकारी के विषय में 65 प्रतिशत छात्राओं ने अपनी सहमती जताई, जबकि 35 प्रतिशत छात्राओं को इसकी जानकारी नही थी।
5. कुल 85 प्रतिशत छात्राओं ने सहमति व्यक्त कि उनको कैरियर निर्माण में स्नातकोत्तर के अलावा भी अन्य कौशल व प्रशिक्षण आवश्यक है, लेकिन 15 प्रतिशत छात्राओं ने अन्य कौशल आवश्यक नहीं माना है।

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6. महाविद्यालय द्वारा आयोजित कैरियर निर्देशन के विभिन्न छात्राओं ने भाग लिया ।
   अ) कुकिंग मे 38 प्रतिशत छात्राओं ने भाग लिया ।
   ब) ज्वेलरी मैकिंग में 8 प्रतिशत छात्राओं ने भाग लिया।
   स) इंग्लिश स्पोकन में 32 प्रतिशत छात्राओं ने भाग लिया।
   द) ब्यूटी पार्लर में 16 प्रतिशत छात्राओं ने भाग लिया ।

इससे ज्ञात होता है कि कैरियर निर्देशन के विभिन्न प्रशिक्षणों में छात्राएँ रूचि लेती है ।

7. कैरियर से संबंधित लक्ष्य के क्षेत्र के संबंध में मीड डे को 4 प्रतिशत छात्राआं ने अपना लक्ष्य बताया। कॉलेज प्रोफेसर 38 प्रतिशत छात्राओं ने अपना लक्ष्य बताया व स्कूल टीचर 40 प्रतिशत छात्राओं ने अपना लक्ष्य बताया। महिला परामर्शदाता 13 प्रतिशत छात्राओं ने अपना लक्ष्य बताया। इससे ज्ञात होता है कि कैरियर निर्माण के लिए छात्राएँ अपने लक्ष्य के प्रति जागरूक है ।
8. कुल 86 प्रतिशत छात्राएँ कैरियर से संबंधित विशेषज्ञो के मार्गदर्शन को आवश्यक मानती है ।
9. कैरियर निर्माण के लिए अपनी योग्यता बढाने के लिए 84 प्रतिशत छात्राओं ने सहमति जतायी, जबकि 16 प्रतिशत ने अपनी योग्यता बढाने के लिए कैरियर निर्माण को आवश्यक नही माना।
10. कैरियर निर्माण में योजना बनाते समय 67 प्रतिशत छात्राओं ने स्वरोजगार को महत्वपूर्ण माना, जबकि 33 प्रतिशत छात्राओं ने रोजगार को महत्व दिया।
11. कैरियर निर्माण से संबंधित जानकारी के लिए 83 प्रतिशत छात्राएँ इंटरनेट का उपयोग करती है ।
12. कुल 82 प्रतिशत छात्राओं ने कैरियर निर्माण में परामर्श को आवश्यक माना ।
13. कुल 68 प्रतिशत छात्राओं ने अपने कैरियर के लिए सी. वी. तैयार किया है, जबकि 32 प्रतिशत छात्राओं ने सी वी तैयार नहीं किया ।

प्रस्तुत शोध के निष्कर्ष रूप मे हम कह सकते हैं कि छात्राएँ केरियर निर्माण के लिए जागरूक है। उन्होंने अपने कैरियर से संबंधित भविष्य की योजना बना रखी है। कैरियर से संबंधित प्रशिक्षण कौशल व परामर्श को आवश्यक समझती है व साथ ही कम्प्यूटर का ज्ञान, इंटरनेट व अंग्रेजी भाषा को भी वे आवश्यक मानती है। छात्राएँ कैरियर निर्माण में माता पिता शिक्षक व स्वयं को महत्वपूर्ण मानती है। छात्राएँ स्वरोजगार को अधिक महत्वपूर्ण मानती है।

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International Journal of Fundamental & Applied Research
Website : www.ijfar.org , ISSN- 2320-7973 Volume-4 Issue-11,Month – February 2017 pp.(04 – 14)

"Structural behaviour of PuS and PtSb by taking an account of effect of covelency"

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ABSTRACT
We have studied the structural and thermos physical properties of PuS and PtSb, using the Modified Three-Body Interaction Potential (MTBIP) model. Phase transition pressures are associated with a sudden collapse in volume. The pressure induced phase transition and related properties of cerium compounds have been investigated by using the three body potential (TBP) model, after modifying it including the van der Waals attraction and Covalency effects. The phase transition pressures and related volume collapses obtained from this model show a generally good agreement with available experimental others data.

INTRODUCTION

The last few decades have witnessed a substantial progress in the field of electronic structure of materials. High-pressure research on structural phase transformations and behaviour of materials under compression based on their calculations or measurements have become quite interesting in the recent few years. The rare-earth chalcogenides and pnictides are considered to be part of the green technology industry, helping to improve energy efficiency in magnets, batteries, glass and computers. It is very difficult to separate the rare earth elements because of the relatively gradual decrease in ionic radii with increasing atomic number. The term phase transition is most commonly used to describe a phase transition of a given medium certain properties of the medium change, often discontinuously, as a result of the change of some external condition, such as temperature, pressure, or others. The rare-earth compounds have recently attracted special attention in many applications owing to their interesting physical, electronic, and mechanical properties that make them significant materials for technological and many areas of industrial applications.

In the present paper we have used a model, which is very successful in predicting structural properties and elastic behaviour at high pressure for PuS and PtSb and the structural phase transition, cohesive energy and elastic constants with pressure by using modified three body potential model with effect of Covalency parameter. The pressure-induced structural phase transition in binary compounds of lanthanides, actinides and pnictides with a NaCl-type structure has received considerable attention in the recent past [1, 2]. In particular, rare-earth (RE) pnictides have various anomalous physical properties, in terms of structural, magnetic and phonon properties [3]. An example can be found in the rare earth (RE) chalcogenides and pnictides, where the structural optical and electrical properties at high pressure have been extensively studied [4-7]. The rare-earth 4f–5d interactions and the hybridizations between the rare-earth non-4f and pnictogen p states are responsible for many fascinating phenomena that occur in rare-earth monopnictides [8]. Mullen et al. [9] concluded that the magnetic–lattice interaction for HoSb and TmSb and the nature of this transition is complicated. Because of the interesting properties of these less explored rare earth sulphide and antimonides and the fact that no work has been done with the potential model including Covalency effects, we thought it pertinent to apply a modified three body potential model (MTBPM) which includes the covalence effect in the potential model. The importance of covalence effect in rare earth mono

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antimonides has already been emphasized by Pagare et al.[11]and Vaitheeswaranet al.[10]. Vaitheeswaran et al. reported that their results on bulk moduli under high pressure is doubled which may be due to increase in covalent bonds. Pagare et al. [12] found discrepancy in their results on pressure derivatives of bulk moduli and they gave main reasons as partial covalent nature of these rare earth mono antimonides. Shirotoni et al. [12] has also confirmed the covalent character in chemical bond between atoms. Sadhana s. and Purvee b.[13] presented modified interaction potential model (MIPM) has successfully predicted the compression curves and phase diagrams giving the phase transition pressures, associated volume collapses and elastic properties correctly for these rare earth antimonides. The inclusion of three body interactions with Covalency effect has improved the prediction of phase transition pressures over that obtained from the two-body potential and TBI without Covalency. The phase transition occurs from NaCl (B1) to CsCl (B2) structure when the pressure is applied to alkali halides and hydrides and other materials [14-27]. The high-pressure experiments performed on CaO [9], SrO [10], SrS [11], CaTe and SrTe [25] and Ba chalcogenides [26, 27] show that the heavy alkaline earth chalcogenides (AX) form the second largest group of the partially ionic crystals undergoing B1-B2 transition after alkali halides.

Inspired from the above remarks, we thought it pertinent to include the effects of both the vdW attraction [39] and the covalency [40] in the framework of TBP [32, 37] model, probably for the first time, to reveal the high pressure phase transitions and associated properties of partially ionic PuS and PtSb.The resulting formulation of the modified TBIP (MTBIP) model has been described in section II. The application of this model to predict the phase transition properties of given compounds are presented and discussed in the next section.

2. Potential Model and Method of Calculations

Application of pressure directly results in compression leading to the increased charge transfer of the overlapping of electron shells of the adjacent ions in solids. Under compression, the outer most electronic shells of the adjacent ions/atoms overlap giving rise to charge transfer or many-body interactions. In this work, we have expressed a modified three body interaction potential (MTBIP) model which takes proper account. Including long-range (LR) attraction due to Coulomb and charge transfer (many-body) interactions arising due to the presence of coulomb screening effect due to the delocalized f electrons of rare-earth atoms modified by Covalency effects and short-range (SR) repulsive interaction.

The knowledge of inter-atomic interactions is of paramount importance as it provides clear understanding of the crystal properties. These interatomic interactions are generally divided into two classes.

1. **Long Rang (LR) Interaction:** The long range interaction generally consists of the coulomb interaction, the three body interaction and interaction due to effect of covalence.
2. **Short Rang (SR) Interaction:** These interactions include the van der Waals attraction and the overlap repulsion.

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In equilibrium state of a crystal, these interactions gives rise to an energy defined, as the energy defined, as the energy required to separate its constituent ions by and infinite distance relative to each other. To the define cohesion, we compare the total energy of the solid, kinetic plus potential, with the energy of the same number of free neutral atoms as infinite separation. A crystal can only be stable if its total energy is lower than the total energy of the atoms or molecules when free. The difference (crystal energy-free energy) is the "Cohesive energy" i.e.

Free energy- crystal energy=cohesive energy.

2.1 Present Modified Three- Body Interaction Potential (MTBIP)

The various interactions and the corresponding potentials discussed above can be collected together to represent the potential energy of the ionic crystal lattice.

Thus, the possible total interactions for NaCl and CsCl structure solids can be written as the sum of the energies expressed as:

$$\varphi(r) = \varphi_c(r) + \varphi_r(r) + \varphi_{\text{cov}}(r) + \varphi_R(r) \qquad (2.1)$$

Where various terms correspond to the coulomb attraction $(\varnothing c(r))$, three body interaction $(\varnothing c(r))$, , $(\varnothing c(r))$, vdW interaction, overlap repulsion $\varnothing R(r)$ and $(\varnothing_{\text{cov}}(r))$ term indicates interaction potential due to effect of Covalency between the atoms.

$$\varphi(r) = \sum_{ij} \frac{\sum_i \sum_i e^2}{rij}[1 + \tfrac{2n}{Z}(f_T(r_{ij}) + f_E(r_{ij}))] - \sum_{ij} C_{ij} r_{ij}^{-6} - \sum_{ij} d_{ij} r_{ij}^{-8} + bn B_{+-} \exp(r_+ + r_- - r)/p_{+-}$$

$$+ \tfrac{1}{2} bn' B_{++} \exp(2r_+ - k_1 r)/p_{++} + \tfrac{1}{2} bn' B_{--} \exp(2r_- - k_1 r)/p_{--} \qquad (2.2)$$

The first terms is long-range coulomb interactions. The second and third terms are long-range three-body interactions and interactions due to effect of Covalency.

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The relevant expression for the cohesive energy ∅ (B1) per unit cell for NaCl Structure in the framework of modified Hardy's DDM of Motida [31] is given by

$$\varnothing(Bl) = -\alpha_m \frac{Z^2e^2}{r_1} - \frac{12ame^2Z}{r_1}[f_T(r) + f_E(r)] - \frac{C}{r_1^6} - \frac{D}{r_1^8} + 6b[\beta_{+-}\{\exp(r_+ + r_- - r1)/p_{+-}\}$$

$$+\beta_{++}\{\exp(2r_+ - k_1 - r_1)/p_{++}\} + \beta_{--}\{\exp(2r_- - k_2 - r_1)/p_{--}\} \qquad (2.3)$$

and the same for CsCl structure is given by

$$\varnothing(B2) = -\alpha_m \frac{Z^2e^2}{r_2} - \frac{16\alpha_m e^2Z}{r_2}[f_T(r) + f_E(r)] - \frac{C'}{r_2^6} - \frac{D'}{r_2^8} + 8b[\beta_{+-}\exp\{r_+ + r_- - r_2)/p_{+-}\}]$$

$$+8b[\beta_{++}\exp\{r_+ - k_2r_2)/p_{++}\}] + 8b[\beta_{--}\exp\{2r_- - k_2r_2)/p_{--}\}] \qquad (2.4)$$

Here, α_m (α_m') are the Madelung constants for NaCl (CsCl) structures. C (C') and D (D') are the overall van der Waals (vdW) coefficients [32] corresponding to d-d and dq interactions for B1 (B2) phases. The values of these coefficients have been evaluated using their expressions. βij (j=1,2) (=1+zi/ni+zj/nj) are the Pauling coefficients with z is the valency and b (ρ) are the range (hardness) parameters, r (' r) are the nearest neighbour (nn) separations for NaCl (CsCl) structures. ri (rj) are the ionic radii of ions i (j) whose values have been directly taken from available data.

AT T= 0 k and transition pressure P, the Gibb's free energy for the NaCl (B1) structure is given by

$$G_1 = \varnothing(B1) + pv_1 \qquad (2.5)$$

And then for CsCl (B2) structure in given by

$$G_2 = \varnothing(B2) + PV_2 \qquad (2.6)$$

AT the phase transition pressure P_t,

$$G_1 = G_2 \qquad (2.7)$$

$$i.e. \varnothing(Bl) + PV_1 = \varnothing(B2) + PV_2 \qquad (2.8)$$

From equation by putting $P=P_t$, we get

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$$P_t = \frac{\varnothing(B2) - \varnothing(B1)}{V_1 - V_2} = \frac{\Delta\varnothing}{\Delta v} \qquad (2.9)$$

Where Δ v is the volume change and is called the phase transition volume and $\Delta\varnothing$ is the difference between the cohesive energies of phases B1 and B2.

The lattice energies expressed by Eqns.2.1, 2.2, 2.3 and 2.4 consist of the long range Coulomb energy (first term) and the TBI energy modified to include the effect of Covalency (second term), the vdW attraction energy is due to d-d and d-q interactions (third and fourth terms) and the overlap repulsive energy is expressed by the HF type[32] repulsion extended upto the second neighbour ions (fifth, sixth and seventh terms).The modified (MTBIP) model described by Eqns. (2.3) and (2.4) for the NaCl and CsCl phases respectively, contains three model parameters (b, ρ, fm(r)), namely the range (b), hardness (ρ). In the case of chalcogenides (pnictides), which is consistent with the number of electrons, cation are taking part in the crystal bonding and not fitted to reproduce any crystal property b and ρ are the short range parameters, which can be determined from the equilibrium condition:

$$\left[\frac{d\phi}{dr}\right]_{r=r_o} = 0 \qquad (2.10)$$

The values of these model parameters b, ρ, $f_T(r)$ and $f_E(r)$ have been listed in Table 1 and used to compute the phase transition pressures in the following sections.

Table 1 Input data and model parameters for PuS and PtSb.

Crystals	Input parameters	Model Parameter			
	r_o (^{0}A)	b(10^{-12} erg)	ρ(^{0}A)	f_T (r)	f_E (r)
PuS	2.7718	16.821	0.269	-3.84	0.0331
PtSb	2.982	13.9	0.268	-13.55	0.0572

It is obvious from Table 2 that the present (MTBIP) model has correctly predicted the relative stability of competitive structures as the values of Δø are positive in all cases. The present MTBIP model thus predicts correctly that B1 phase is thermodynamically and mechanically stable at ambient conditions. We

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have used method of minimization to compute the values of interionic distance at different pressures in both the B1 and high pressure B2 phases.

Table 2 Cohesive properties and relative stability of PuS and PtSb.

Crystals	Equilibrium separation(^{0}A)		Cohesive energy (KJ/mole)		ΔØ (KJ/mole)(+)
	r_0(B1)	r_0(B2)	Ø(B1)(-)	Ø(B2)(-)	
PuS	2.7801	2.910	2899.8	2790.1	109.7
PtSb	2.760	2.99	2661.8	2424.2	237.6

The calculated values of phase transition pressure and elastic constants achieved in the present investigation are reported in tables 2 and 3, respectively. It is evident from the results obtained in the present study that our calculated values for phase transition pressure are in better agreement with the available experimental data as compared to those of [33]. Our computed values of P_t and volume collapse are in good agreement with the experimental data and better than those obtained by earlier workers [33].

Table 3 High pressure behaviour of PuS and PtSb.

Crystals	Phase transition pressure (GPa)		Relative change in volume (%)	
	Cal.	Exp.	Cal.	Exp.
PuS	36.28	60	11.39	-
PtSb	90.6	-	28.23	-

Fig 1 Variation of ΔG with pressure for PuS.

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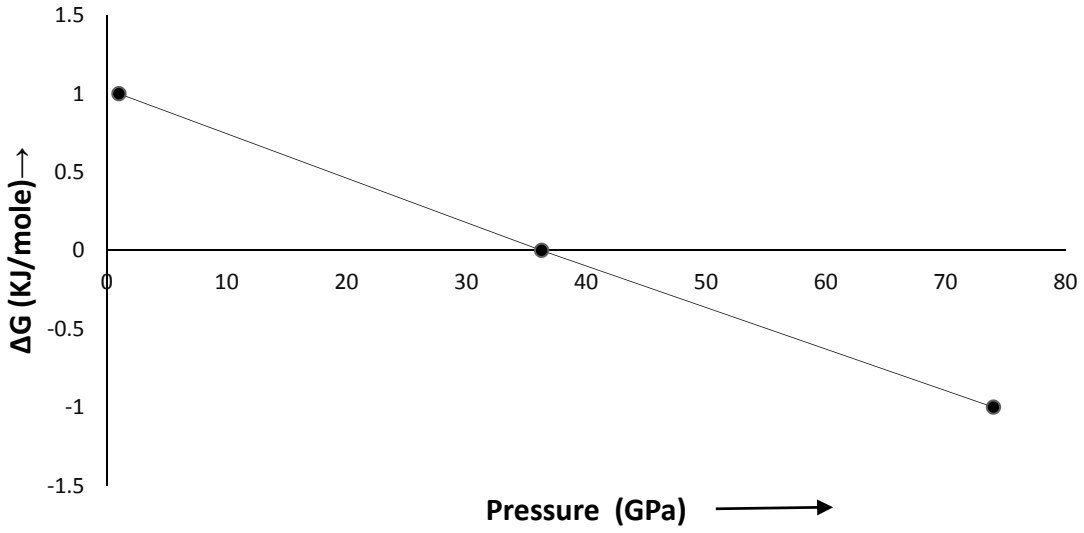

Fig 2 Variation of Vp/Vo with pressure for PuS.

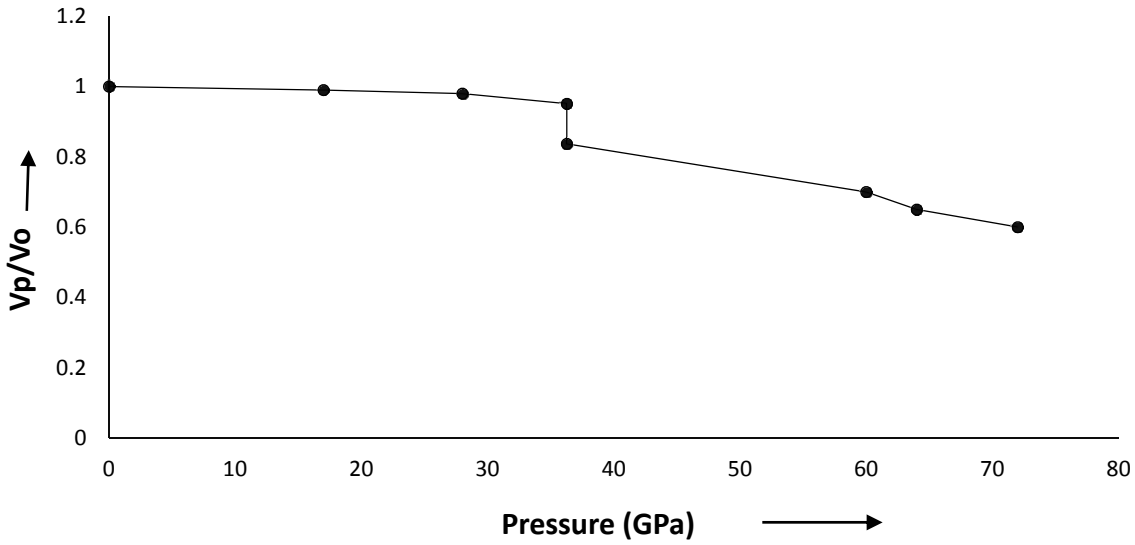

Fig 3 Variation of ΔG with pressure for PtSb

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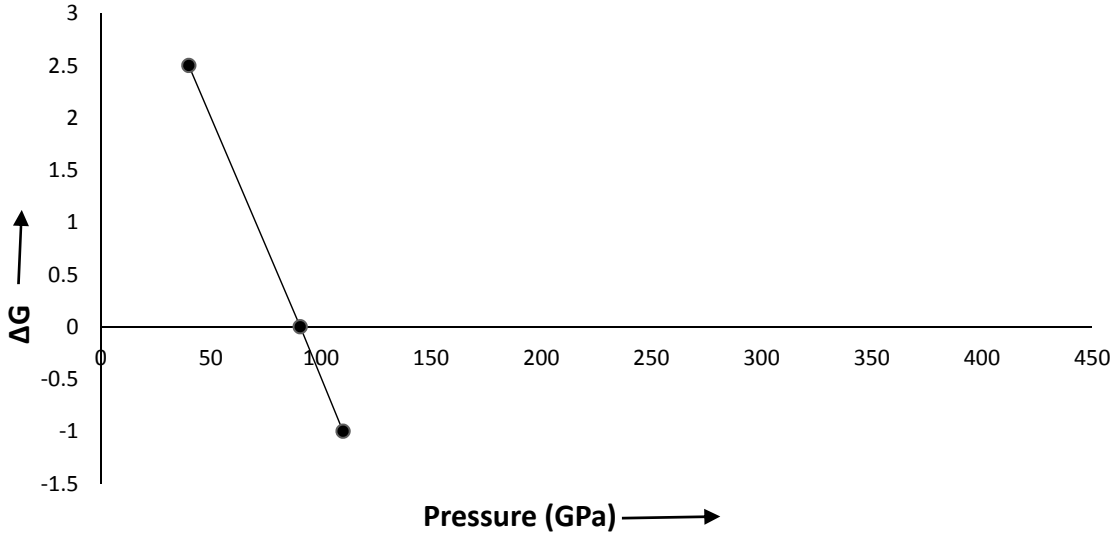
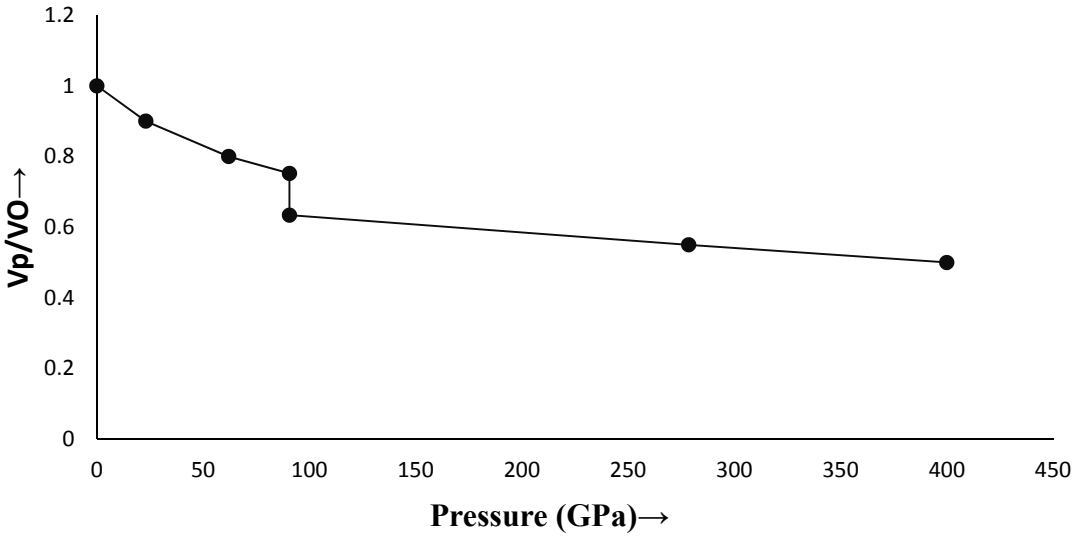


Fig 4: **Variation of Vp/Vo with pressure for PtSb**



It is clear that during the phase transition from NaCl to CsCl, the volume discontinuity in pressure volume phase diagram identifies the same trend as the other experimental approach. It is revealed from Figs. 1, 2, 3 and 4 that our potential model can effectively explain the high pressure behaviour of these compounds.

CONCLUSION

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In summary, we have applied modified interaction potential (MTBIP) model to investigate the structural and mechanical properties of PuS and PtSb. Both given crystals crystallize in six fold-coordinated NaCl-type structure (B1) at ambient conditions and under pressure they transform to the eight fold coordinated CsCl-type structure (B2). Our calculated phase transition pressure and volume collapses are in general in better agreement with the available experimental and better than theoretical results. During the phase transition from NaCl to CsCl, the volume discontinuity in pressure volume phase diagram identifies the occurrence of first order phase transition.

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International Journal of Fundamental & Applied Research
Website : www.ijfar.org , ISSN- 2320-7973 Volume-4 Issue-11,Month – February 2017 pp.(15 – 22)

Impact of MGNREGA on rural people in Anantnag district of the State of Jammu and Kashmir

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ABSTRACT
The National Rural Employment Guarantee Act was introduced on the lines of Gandhian Directive Principles of State Policies laid out by the Constitution of India with the very purpose of bridging the gap and empowering the rural poor by increasing their buying capacity and making them more self sufficient. This rural welfare scheme underpins the sole objective to reduce rural poverty and rural unemployment to create better socio-economic conditions for the rural people. The present paper attempts to assess the impact of MGNREGA scheme on socio-economic conditions of rural people working in the scheme for last 10 years since the inception of the scheme in terrorism affected district Anantnag of the State of Jammu and Kashmir.

INTRODUCTION

Anantnag District lies in the Southern sector of the Kashmir Valley. The district is known for its majestic and high mountains, many perennial springs and streams flowing with melodious sounds and enchanting beauty, famous heath resort which make her climate pleasant and rejuvenating. Besides, fertile soil, suitable agro-climatic conditions, crop diversity, production of fresh and dry fruits, trout fish rearing add to its greatness and fame. As the district is surrounded by the Peer Panchal Range which stretches in its South and South-East, it has a temperature climate in summer than other districts of the valley. In winter, however, snowfall is heavier and temperature is relatively low. Being bordered on two sides by mountains, the monsoon does occasionally reach the district.

Rural Development is a process of change, by which the efforts of the people themselves are united, those of government authorities to improve their economic, social and cultural conditions of communities in to the life of the nation and to enable them to contribute fully to national programme (United Nations 2012).Economic development of a country depends on the proper utilization of both human and non-human resources. The large swathes of the Indian land at the eve of Independence faced with economic problems such as the abject poverty. There were differences in the levels of per capita income and consumption, literacy, medical and health facilities, population growth, infrastructure development, employment opportunities. Independent India thus, inherited a backward economy in which prevailed extreme poverty and deprivation, characterized by stagnant agricultural output, an uneven and weak industrial sector and low capital resources (Narang, 1996). The governments objective then was to attain and accelerate the economic development of the country (Bhuimali, 2004). Till date, numerous programmes have been taken up by Indian government to address the problem of rural unemployment so that the rural people are not forced to move out for survival. Some past important welfare schemes such as Food for Work Programme, *Sampoorna Gramin Rozgar Yojana* (SGRY), Wage Employment Programmes, *Jawahar Rozgar Yojana*/ *Jawahar Gram Samridhi Yojana* had eroded their basic objective of providing needful

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employment in areas of extreme poverty and chronic unemployment because of the universalisation of schemes and malfunction of the system. In spite of these programmes, country witnessed a declining growth rate of employment in rural areas during the period from 1972-73 to 2004-05.

For anti-poverty programmes had not delivered as per desired results so a debate on the National Rural Employment Guarantee Bill had sparked. The "Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)" was enacted to reinforce the commitment towards livelihood security in rural areas. The Act provides a legal guarantee of 100 days work in a financial year (1st April-31st March) to every rural household whose adult members are willing to do unskilled manual work at a statutory minimum wage rate. (Eleventh Five Year Plan, Vol. 3; 86). Now, the scheme has completed a decade in year 2016, an important question arouses whether scheme has been successful in achieving its very basic objectives. The present paper is conducted to assess the impact of scheme on social and economic conditions of workers participated in MGNREGA scheme since its inception in the study area.

2. Need and Objectives of the Study

The selected district Anantnag is terrorism affected area so people's earnings are substantially affected by terrorist activities. Since there is very low investment by entrepreneurs in small business such as small scale and cottage industries so a great proportion of working population is involved in agriculture activities in general and horticulture activities in particular. This creates disguised unemployment in the region.

Consequently, the present study has been carried out to examine the socio-economic status of people in district Anantnag of Jammu Kashmir and also to know about the Transparency and Accountability in the scheme.

3. Methodology

The present study is based on primary data collected by researcher from six villages Chinegund, Lehindagan, Katsoo, Bon-Numbal, Akoora situated in two Blocks i.e. Dachinipora and Khoveripora Block in District Anantnag by applying simple random sampling. From each village of the two blocks, 60 beneficiaries holding active job cards in year 2015-16 were selected. In all, a total of 360 beneficiaries have been chosen for study.

4. Results and Discussion

4.1 Impact of type of schooling of Children of Respondents

To check social impact of scheme, provision of children's education constitutes important place. Here purpose of comparison is to see if there any change in type of schooling of children of respondents after working in the scheme.

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Table 1 Type of Schooling of the Children of Respondents before and after MGNREGA

Before MGNREGA														
Type of School Education of Children of respondents	**Anantnag**													
	Dachinipora Block						**Khoveripora Block**							
	Chingund		**Lehedingan**		**Katsoo**		**Bon-Numbal**		**Akoora**		**Fohar**		**Total**	
Not sending to School	0	0%	9	15%	2	3.3%	0	0%	0	0%	1	1.7%	12	3.3%
Govt. School	48	80%	48	80%	54	90%	43	71.7%	31	51.7%	53	88.3%	277	76.7%
Private	12	20%	3	5%	4	6.7%	17	28.3%	29	48.3%	6	10%	71	19.7%
Total	60	100%	60	100%	60	100%	60	100%	60	100%	60	100%	360	100%
After MGNREGA														
Anantnag														
Type of School Education of Children of respondents	**Dachinipora Block**						**Khoveripora Block**							
	Chingund		**Lehedingan**		**Katsoo**		**Bon-Numbal**		**Akoora**		**Fohar**		**Total**	
Not sending to School	0	0%	1	1.7%	0	0%	0	0%	0	0%	1	1.7%	2	0.6%
Govt. School	38	63.3%	54	90%	46	76.7%	39	65%	29	48.3%	46	76.7%	252	69.8%
Private	22	36.7%	5	8.3%	14	23.3%	21	35%	31	51.7%	13	21.7%	106	29.4%
Total	60	100%	60	100%	60	100%	60	100%	60	100%	60	100%	360	100%

Source: Primary data

The Table 1 shows the educational status of children of the respondent families before and after working in the MGNREGA. Out of total sample of 360 respondents, before joining MGNREGA 12 families were not sending their children to school, 277 families were sending their children to Government schools and 71 families were sending their children to private schools. After joining MGNREGA only two families are not sending their children to school, 252 families are sending their children to Government schools and 106 families are sending their children to private schools. It shows a positive impact as majority of families are sending their children to school and are also providing better education to their children and as of now majority of families are sending their children to private schools.

4.2 Availability of Sanitation Facilities

Provision of sanitation facilities constitutes a basic human need and is directly concerned with hygiene and health.

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Table 2 Availability of Sanitation facilities before and after MGNREGA

Before MGNREGA														
Type of Sanitation	**Anantnag**													
	Dachinipora Block						**Khoveripora Block**							
	Chingund		**Lehedingan**		**Katsoo**		**Bon-Numbal**		**Akoora**		**Fohar**		**Total**	
Open	0	0%	20	33.3%	5	8.3%	0	0%	0	0%	5	8.3%	30	8.3%
Private owned	54	90%	24	40%	47	78.3%	54	90%	51	85%	48	80%	278	77%
Public	6	10%	16	26.7%	8	13.3%	6	10%	9	15%	7	11.7%	52	14.4%
Total	60	100%	60	100%	60	100%	60	100%	60	100%	60	100%	360	100%
After MGNREGA														
Type of Sanitation	**Dachinipora Block**						**Khoveripora Block**							
	Chingund		**Lehedingan**		**Katsoo**		**Bon-Numbal**		**Akoora**		**Fohar**		**Total**	
Open	0	0%	7	11.7%	2	3.3%	0	0%	0	0%	0	0%	9	2.5%
Private owned	60	100%	45	75%	58	96.7%	60	100%	60	100%	60	100%	343	95%
Public	0	0%	8	13.3%	0	0%	0	0%	0	0%	0	0%	8	2.2%
Total	60	100%	60	100%	60	100%	60	100%	60	100%	60	100%	360	100%

Source: Primary data

The table 2 portrays the latrine sanitation before and after joining the MGNREGA.Out of total sample of 360 respondents 30 households had no latrine sanitation, 278 households had their own private latrine and 52 households were using public latrine sanitation before joining MGNREGA. Later after earning from MGNREGA job only 9 households have no latrine sanitation and the numbers of households who have their own latrine sanitation have increased to 343 (95%). In Lehindagan village there are some households who have no latrine sanitation belonging to *Gujjar* category a sub caste under Schedule Tribe (ST). Overall analysis shows rural poor who were working in scheme have built their own private sanitation facilities. Moreover, it should be highlighted that government launched other schemes side by side relating to provision of sanitation facilities in rural areas in last one decade.

4.3 impact on Rural Migration

Lack of employment and livelihood opportunities in rural areas is basic reason of rural migration in search of work. MGNREGA scheme has been framed in such a way to stop migration of workers especially in lean period by providing 100 days of employment. The study finds considerable decline in village to village migration. However, migration from village to other states declined less. The main reason of this pattern is winter session in which these villages remain covered with snow and most of job workers prefer to migrate neighbor states to work on high wage rates.

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Table 3 Migration of Respondents before and after MGNREGA

Before MGNREGA														
Pattern of Migration before MGNREGA	Anantnag													
	Dachinipora Block						Khoveripora Block							
	Chingund		Lehedingan		Katsoo		Bon-Numbal		Akoora		Fohar		Total	
Village to Village	21	35%	19	31.7%	20	33.3%	0	0%	6	10.0%	0	0%	66	18.3%
Village to Other States	0	0%	0	0%	0	0%	44	73.3%	29	48.3%	48	80%	121	33.5%
No Migration	39	65%	41	68.3%	40	66.7%	16	26.7%	25	41.7%	12	20%	173	47.9%
Total	60	100%	60	100%	60	100%	60	100%	60	100%	60	100%	360	100%
After MGNREGA														
Pattern of Migration after MGNREGA	Dachinipora Block						Khoveripora Block							
	Chingund		Lehedingan		Katsoo		Bon-Numbal		Akoora		Fohar		Total	
Village to Village	11	18.3%	7	11.7%	11	18.3%	0	0%	0	0%	0	0%	29	8.0%
Village to Other States	0	0%	0	0%	0	0%	36	60%	27	45%	42	70%	105	29.1%
No Migration	49	81.7%	53	88.3%	49	81.7%	24	40%	33	55%	18	30%	226	62.6%
Total	60	100%	60	100%	60	100%	60	100%	60	100%	60	100%	360	100%

Source: Primary data

The table 3 portrays the pattern of migration of respondents before and after working in MGNREGA. All in all, study shows scheme has positive impact on rural distress migration though it could not be completely stopped.

4.4 Impact on Annual Earnings, Expenditure and Savings

Table 4 Average Annual Income of Household before and after MGNREGA

Average Annual Income	Anantnag					
	Dachinipora Block			Khoveripora Block		
	Chinegund	Lehindagan	Katsoo	Bon-Numbal	Akoora	Fohar
Before MGNREGA	59666.66	40666.66	55166.66	75333.33	72333.33	68666.66
After MGNREGA	71666.66	48333.33	64500.00	90000.00	86000.00	80333.33
Increase in Average Annual Income	12000	7666.67	9333.34	14666.67	13666.67	11666.67
Percentage Increase in Average Annual Income	20.11%	18.85%	16.91%	19.46%	18.89%	16.99%

Source: Computed from Primary data

The table 4 describes average annual income of workers before joining and after joining the scheme. It also shows percentage increase in their annual average income after working in the scheme. There is positive impact on the income of workers and percentage increase in average annual income ranges between15% to 20%.

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Table 5 Average Annual Expenditure of Households before and after MGNREGA

Average Annual Expenditure	Anantnag					
	Dachinipora Block			Khoveripora Block		
	Chinegund	Lehindagan	Katsoo	Bon-Numbal	Akoora	Fohar
Before MGNREGA	49920	35780	47420	65420	61140	54305
After MGNREGA	56742	40300	52890	73440	68150	62640
Increase in Average Annual Expenditure	6822	4520	5470	8020	7010	8335
Percentage Increase in Average Annual Expenditure	13.66%	12.63%	11.53%	12.25%	11.46%	15.34%

Source: Computed from Primary data

The table 5 describes average annual expenditure and percentage increase in household expenditure after earning from MGNREGA job. The Households average annual expenditure have increased and ranging between 11% to 16% from village to village.

Table 6 Average Annual Savings of Household before and after MGNREGA

Average Annual Savings	Anantnag					
	Dachinipora Block			Khoveripora Block		
	Chinegund	Lehindagan	Katsoo	Bon-Numbal	Akoora	Fohar
Before MGNREGA	9746.66	4886.66	7746.66	9913.33	11193.33	14361.66
After MGNREGA	14924.66	8033.33	11610.00	16560.00	17850.00	17693.33
Increase in Average Annual Savings	5178	3146.67	3863.34	6646.67	6656.67	3331.67
Percentage Increase in Average Annual Savings	53.12%	64.39%	49.87%	67.04%	59.46%	23.19%

Source: Computed from Primary data

Table 6 shows percentage increase in average annual savings of households in six villages. Expenditure except in village Fohar, average annual savings of households participating in scheme increased more than 50%. The analysis shows a significant impact of the scheme on the increase in savings of the households. However, total savings of households are not so sufficient to assure them a semblance of social and economic security in future.

5. Transparency and Accountability

5.1 Entries in the Job cards

Table 7 Distribution of Respondents according to entries in the job card

Entries on job cards about wages and work	**Anantnag**							
	Dachinipora Block			**Khoveripora Block**				
	Chingund	**Lehindagan**	**Katsoo**	**Bon-Numbal**	**Akoora**	**Fohar**	**Total**	
Job cards Having entries	5	3	3	3	1	4	19	5.3%
Job cards Not having entries	55	57	57	57	59	56	341	94.5%
Total	60	60	60	60	60	60	360	100%

Source: Primary data

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At the time of survey it is found that only 5 job cards have been entered with information about wages and number of days work done by workers. About 95% of job cards are found without entry of such information.

5.2 Payment of wages

Table 8 Distribution of Respondents according to payment of Wages

Wages on time	Anantnag						
	Dachinipora Block			Khoveripora Block			
	Chingund	Lehedingan	Katsoo	Bon-Numbal	Akoora	Fohar	Total
Yes	0	0	0	0	0	0	0
No	38	53	15	47	19	24	196
Sometime	22	7	45	13	41	36	164
Total	60	60	60	60	60	60	360

Source: Primary data

The table 8 portrays that out of total sample of 360, 164 respondents (45.4%) reported that sometime wages were paid within a period of 15 days and majority of respondents reported that there is delay in payment of wages. Important reasons for the delay in payment of wages as told by the respondents in group discussions were delay in making available the MGNREGS funds, lack of staff, delay in measurement, and delay on the part of the bank etc

5.3 Awareness about worksite facilities

Table 9 Distribution of Respondents according to worksite facilities

Awareness about worksite facilities	Anantnag							
	Dachinipora Block			Khoveripora Block				
	Chingund	Lehindagan	Katsoo	Bon-Numbal	Akoora	Fohar	Total	
Yes	6	4	5	6	3	6	30	8.3%
No	54	56	55	54	57	54	330	91.7%
Total	60	60	60	60	60	60	360	100%

Source: Primary data

Table 9 shows that out of total sample of 360 respondents only 30 respondents (8.3%) have awareness about the worksite facilities and majority of 330 respondents (91.7%) have not awareness about worksite facilities. When observation was made at the time of survey there found no such facility at worksite. When beneficiaries were interviewed they stated that they did not aware of such provisions in the scheme. Majority of work done under contractors and he never provided such facilities.

All in all it can concluded that at grassroots level implementation of MGNREGS in study area is severely beset by malpractices; corruption; inefficiency; lack of knowledge; least participation; concealing information etc.

SWOT Analysis

Strengths

1. As the scheme provides guarantee for 100 days of employment to the willing household in the vicinity of village.
2. One of the strength of the scheme is financial inclusion strategy by opening bank or post office account. It is a positive and appreciated impact that the villagers are making transactions with Banks or post office in the study area.

Weaknesses

1. Delays in wage payments always have been a matter of in previous employment programs and this issue continues to plague the MGNREGA.

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2. Political interference and pressure of higher authorities create disruption in functioning of *Gram Panchayats*. Works assigned by *Panchayats* are largely political motivated.
3. Low wage rate in MGNREGA is also a big problem.

Opportunities

1. Availability of worksite facilities is important factor that can raise the profitability of the scheme in future.
2. Literacy among the members of *panchayat* and *Sarpanchs* also one more step of success.

Threats

1. MGNREGA has become important part of the life of rural poor and a considerable share of their livelihood depends upon MGNREGA earnings.
2. It is found that contractors take contracts from *Sarpanchs* and ward members for MGNREGA works and with help of machinery they completed work ruin the concept of labour work.

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Plastics, the Environment and Human Health: present practice and future possibilities

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ABSTRACT
Plastics have transformed everyday life; usage is increasing and annual production is likely to exceed 300 million tonnes by 2010. In this concluding paper to the Theme Issue on Plastics, the Environment and Human Health, we synthesize current understanding of the benefits and concerns surrounding the use of plastics and look to future priorities, challenges and opportunities. It is evident that plastics bring many societal benefits and offer future technological and medical advances. However, concerns about usage and disposal are diverse and include accumulation of waste in landfills and in natural habitats, physical problems for wildlife resulting from ingestion or entanglement in plastic, the leaching of chemicals from plastic products and the potential for plastics to transfer chemicals to wildlife and humans. Plastic is undoubtedly to reign among the variety of materials for its varied applications; engineering machinery parts to domestic appliances to packaging's. Warning bells are now sounding aloud against the deterioration of the eco-system; witnessed by the over use of plastics. From environmental sustainability perspective, literature survey suggests, efforts are focused mainly on formulating methods to achieve maximum plastic waste recycling targets. Still, all plastic waste collection and even whole recycling of collected plastic can't be ensured. However, plastic recycling does not prove economical due to collection and sorting difficulties. Moreover, Single use plastic waste remains at large from collection and hence recycling. It is dumped in the landfill sites along with solid food waste. This research paper enlists the shortcomings in the existing literature and proposes a renewed scope in achieving; resource, economic and environment sustainability by managing a complete plastic forward and reverse supply chain.

INTRODUCTION

Many of the current applications and the predicted benefits of plastic follow those outlined by Yarsley and Couzens in the 1940s. Their account of the benefits that plastics would bring to a person born nearly 70 years ago, at the beginning of this '*plastic age*', was told with much optimism: *It is a world free from moth and rust and full of colour, a world largely built up of synthetic materials made from the most universally distributed substances, a world in which nations are more and more independent of localised naturalised resources, a world in which man, like a magician, makes what he wants for almost every need out of what is beneath and around him (*Yarsley & Couzens 1945*, p. 152).* The durability of plastics and their potential for diverse applications, including widespread use as disposable items, were anticipated, but the problems associated with waste management and plastic debris were not. In fact the predictions were '*how much brighter and cleaner a world* [it would be] *than that which preceded this plastic age*' (Yarsley & Couzens 1945, p. 152).

This paper synthesizes current understanding of the benefits and concerns surrounding the use of plastics and looks to

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challenges, opportunities and priorities for the future. The content draws upon papers submitted to this Theme Issue on Plastics, the Environment and Human Health together with other sources.

PLASTICS AS MATERIALS :

Plastics are inexpensive, lightweight, strong, durable, corrosion-resistant materials, with high thermal and electrical insulation properties. The diversity of polymers and the versatility of their properties are used to make a vast array of products that bring medical and technological advances, energy savings and numerous other societal benefits. As a consequence, the production of plastics has increased substantially over the last 60 years from around 0.5 million tonnes in 1950 to over 260 million tonnes today.

PLASTIC INDUSTRY PROFILE - Accumulation of Plastic Waste in the Natural Environment-

In India, plastic industry is progressing at a rapid rate; the growth rate is remarkable; although, as compared to the developed countries per capita consumption of plastic is very less. Consistent growth of the plastic industry is observed in furniture sector, agriculture, sanitation and electronic household and industrial appliances sector. Growth potential is catching up very fast in the packaging sector; plastic is being preferred over wooden, paper and glass packaging. HDPE and PVC plastic are predominantly used in furniture, agriculture and sanitation sector while LDPE, PET plastic are widely used in foodstuffs packaging. Indian market trends suggest plastic in packaging sector has a promising growth in the years to come.

Substantial quantities of plastic have accumulated in the natural environment and in landfills. Discarded plastic also contaminates a wide range of natural terrestrial, freshwater and marine habitats, with newspaper accounts of plastic debris on even some of the highest mountains. There are also some data on littering in the urban environment; however, by comparison with the marine environment, there is a distinct lack of data on the accumulation of plastic debris in natural terrestrial and freshwater habitats. There are accounts of inadvertent contamination of soils with small plastic fragments as a consequence of spreading sewage sludge, of fragments of plastic and glass contaminating compost prepared from municipal solid waste and of plastic being carried into streams, rivers and ultimately the sea with rain water and flood events .However, there is a clear need for more research on the quantities and effects of plastic debris in natural terrestrial habitats, on agricultural land and in freshwaters. Inevitably, therefore, much of the evidence presented here is from the marine environment. From the first accounts of plastic in the environment, which were reported from the carcasses of seabirds collected from shorelines in the early 1960s, the extent of the problem soon became unmistakable with plastic debris contaminating oceans from the poles to the Equator and from shorelines to the deep sea. Most polymers are buoyant in water, and since items of plastic debris such as cartons and bottles often trap air, substantial quantities of plastic debris accumulate on the sea surface and may also be washed ashore. As a consequence, plastics represent a considerable proportion (50–80%) of shoreline debris. Quantities are highly variable in time and space, but there are reports of more than 100 000 items m^{-2} on some shorelines and up to 3 520 000 items km^{-2} at the ocean surface. Gyres and oceanic convergences appear to be particularly contaminated, as do enclosed seas such as the Mediterranean. Despite their buoyant nature, plastics can become fouled with marine life and sediment causing items to sink to the seabed. For example, shallow sea beds in Brazil were more heavily contaminated than the neighbouring shorelines, indicating that the seabed may be an ultimate sink even for initially buoyant marine debris in some locations around Europe, it has been suggested that quantities on the seabed may exceed 10 000 items ha^{-1}, and debris has even been reported more than a 1000 m below the ocean surface, including accounts of inverted plastic bags passing a deep-sea submersible like an assembly of ghosts. Quantitative data on the abundance of debris on the seabed are still very limited, but there are

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concerns that degradation rates in the deep sea will be especially slow because of darkness and cold .

SOURCES OF PLASTIC WASTE

Durable plastic products, after its efficient use is sold by the consumer or industry to the scrap vendors, who, after sufficient collection sells it to the recycling plant. Recycled plastic granules are then mixed in certain proportion with the virgin material to form the finished or semi-finished product in the moulding shop. Plastics can be recycled for at least six times before being discarded as waste in the landfills. Plastic wastes of this kind are refrigerator cabinets, washing machine parts, grinder parts, furniture's, television and computer cabinets, etc. generated from household whereas; storage tanks, crates, barrels, computer cabinets, etc. is generated in larger amounts from industries . Another type of plastic waste is from a light weight, single use plastic items whose source of generation is at the household, apartments, community centres, hotels, canteen, event venues, and commercial markets. Plastic wastes of this kind are PET bottles, packaging films, cups, carry bags, milk pouch, etc. Among other sources of generation of plastic waste are agriculture, civil construction sites, hospitals and automobile service centres.

PROBLEMS RELATED TO PLASTIC WASTE

Plastic waste derived out of durable and single use light weight items is collected by rag pickers from municipal dumpsites and landfill sites while the durable plastic waste is purchased by the street vendors from the households and industries. Rag pickers and street vendors earn their livelihood by selling it to the collection centres. All these collected plastic waste is sorted according to their grades, washed and dried. The particular grade of cleaned plastic waste is then crushed into fine chips before being transported to the recycling units for extruding it to form pellets in a pelletizer. Plastic recycling is a sensitive process in the way that if two different grades of plastic get mixed in slightest of the proportion, the whole batch of production gets spoiled for secondary or no further use. In India, recycling units are not technically advanced to run in a safe procedure; release of toxic fumes and unhygienic working conditions is a serious concern. Achievement of planned collection targets of light weight plastic waste is a difficult task since the litters are carried away by the wind and are also strewn on the streets and open fields by the animals. Plastic litters get accumulated in the drainage lines which lead to blocking of the streams, raising the hazards of health, hygiene and environmental safety [8]. Plastic litters are mistakenly ingested by the animals along with the food contained in it leading to its death. Several reports are public about the cows being operated for removal of junk of plastic waste from its stomach. Plastic waste when subjected to sunlight and extreme weather conditions for long duration, starts losing its properties thereby disintegrating into minute invisible fragments. These minute particles contaminate the ocean and soil microbial structure leading to the death of marine creatures and reducing the fertility of the soil. Although plastics put in only about 7% w/w to municipal solid waste, they may add 15% or more to the total heat content of municipal solid waste.

VARIOUS WAYS TO REDUCE THE IMPACTS OF PLASTICS WASTES –

Source Reduction: There are number of ways of achieving source reduction. Examples include:

- Modify design of product or package to decrease the amount of material used.
- Utilize economies of scale with larger size packages.
- Utilize economies of scale with product concentrates.
- Make material more durable so that it may be reused.
- Substitute away from toxic constituents in products or packaging.

Potential plastic markets that may be considered for source reduction include packaging, building and construction, consumer products, electrical and electronic, furniture and furnishings, transportation, adhesives, inks, and coatings.

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Recycling: India ranks highest in terms of plastic recycling percentage (60%) in the world, whereas the world average is only 20% .

Recycling methods could be classified by following types-

- Primary Recycling: Melting, molding and solidification.
- Secondary recycling: Melting and extrusion or injection.
- Tertiary Recycling: Physical and chemical methods that include thermolysis (pyrolysis, catalytic cracking, hydro cracking, etc.) and depolymerisation (alcoholysis, hydrolysis, acidolysis, aminolysis, etc.).
- Quaternary Recycling: Incineration with energy recovery.

Phases of Plastic Recycling: Recycling plastics from MSW encompass four phases of activity collection, separation, processing/manufacturing and marketing

Collection: Collection of plastics involves formal (municipal) sector and informal sector comprising of waste pickers, kabariwala, scrap dealers and bulk buyers. The municipality derives its funds for waste management either through funds designated by the Central Government and funds derived from property taxes.

Separation: It involves both formal and informal sector. Plastics segregated from MSW include a variety of resins. It is not necessary to separate plastics by resin type to allow their recycling, but separation by resin allows the production of the highest-quality recycled products. There are many problems for the plastic recycling industry in India. The supply of recovered plastic is rather volatile due to the decrease in the recovery rate year by year and the dependency on the fluctuating international market. Most plastic recycling enterprises are small and medium sized factories with obsolete equipment and technologies. Financial limitations are a constraint to the technical improvements needed to satisfy market demand. Plastic cannot be recycled indefinitely. In continuous recycling, plastic becomes too contaminated and degraded for use as a secondary material. Secondly pollution occurs during the recycling process. Some factories cannot afford to install pollution control facilities and must therefore discontinue production .

DEGRADABLE PLASTICS- Bioplastics –

Bioplastics are biodegradable plastics, whose components are derived from renewable raw materials. These plastics can be made from abundant agricultural/animal resources like cellulose, starch, collagen, casein, soy protein polyesters and triglycerides .Large scale use of these would help in preserving non-renewable resources like petroleum, natural gas and coal and contribute little to the problems of waste management. Biodegradable plastics degrade over a period of time when exposed to sun and air though the demand for biodegradable plastics is increasing, acceptance of biodegradable polymers is likely to depend on factors like

- Customer response to costs.
- Possible legislation by Governments.
- The achievement of total biodegradability.

Immediate application areas identified in India for biodegradable plastics are agricultural mulch, surgical implants, industrial packaging, wrapping, milk sachets, foodservice, personal care, pharmaceuticals, medical devices, recreational, etc. However, the legal framework for the utilization of biodegradable materials is still very unclear. Within waste management, local authorities in many parts of the world including India don't treat bioplastics as compostable material

SOME OTHER EFFORTS TO MITIGATE IMPACTS OF PLASTIC WASTE -

- ✓ Environmental tax on plastic bags.
- ✓ Incineration with energy recovery.
- ✓ Land filling, this will still be needed for disposal of plastic and other wastes.
- ✓ Reorganization of the recycling sector.
- ✓ Extended producer responsibility
- ✓ Increasing educational initiatives.

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International Journal of Fundamental & Applied Research
Website : www.ijfar.org , ISSN- 2320-7973 Volume-4 Issue-11,Month – February 2017 pp.(23 – 27)

CONCLUSION -

In the perspective of environmental, health and resource sustainability, plastic waste collection and recycling will remain the area of focus. Green house gas emissions at the recycling units can be regulated to minimum by using the advanced state of art recycling methods and equipments. As strong technical and economical substitute to petroleum based plastic is not yet available, it is advised to implement the forward and reverse supply chain very effectively to attain maximum recycling targets. Product redesigning are some solutions to reduce plastic waste at the source.

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