

SOI: 1.1/TAS

DOI: 10.15863/TAS

ISSN 2308-4944 (print)

ISSN 2409-0085 (online)

№ 04 (48) 2017

Teoretičeskaâ i prikladnaâ nauka

Theoretical & Applied Science

Industry and technology

Philadelphia, USA

**Teoretičkaâ i prikladnaâ
nauka**

**Theoretical & Applied
Science**

04 (48)

2017

International Scientific Journal

Theoretical & Applied Science

Founder : **International Academy of Theoretical & Applied Sciences**

Published since 2013 year. Issued Monthly.

International scientific journal «Theoretical & Applied Science», registered in France, and indexed more than 45 international scientific bases.

Editorial office: <http://T-Science.org> Phone: +777727-606-81

E-mail: T-Science@mail.ru

Editor-in Chief:

Alexandr Shevtsov

Hirsch index:

h Index RISC = 1 (65)

Editorial Board:

Prof.	Vladimir Kestelman	USA	h Index Scopus = 3 (38)
Prof.	Arne Jönsson	Sweden	h Index Scopus = 4 (21)
Prof.	Sagat Zhunisbekov	KZ	-
Assistant Prof.	Boselin Prabhu	India	-
Lecturer	Denis Chemezov	Russia	h Index RISC = 2 (61)
Senior specialist	Elnur Hasanov	Azerbaijan	h Index Scopus = 1 (4)
Associate Prof.	Christo Ananth	India	h Index Scopus = - (1)

ISSN 2308-4944



© Collective of Authors
© «Theoretical & Applied Science»

International Scientific Journal

Theoretical & Applied Science

Materials of the International Scientific Practical Conference

Industry and technology

April 30, 2017

Philadelphia, USA

The scientific Journal is published monthly 30 number, according to the results of scientific and practical conferences held in different countries and cities.

Each conference, the scientific journal, with articles in the shortest time (for 1 day) is placed on the Internet site:

<http://T-Science.org>

Each participant of the scientific conference will receive your own copy of a scientific journal to published reports, as well as the certificate of the participant of conference

The information in the journal can be used by scientists, graduate students and students in research, teaching and practical work.

International Scientific Journal

Theoretical & Applied Science



THOMSON REUTERS

Indexed in Thomson Reuters



ISPC Industry and technology, Philadelphia, USA
ISJ Theoretical & Applied Science, 04 (48): 232.

Impact Factor ICV = 6.630

Impact Factor ISI = 0.829
based on International Citation Report (ICR)

The percentage of rejected articles:



ISSN 2308-4944



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 06.04.2017 <http://T-Science.org>

Ameneh Hosseini

researcher,
Alborz higher education institute,
Afghanistan
lostparadise@yahoo.com

**SECTION 21. Pedagogy. Psychology. Innovations
in the field of education.**

A CONFIRMATORY SURVEY OF DIFFERENTIAL ITEM FUNCTIONING

Abstract: For the development of comparable tests in international studies it is essential to examine Differential Item Functioning (DIF) by different demographic groups, in particular cultural and language groups. For the selection of test items it is important to analyze the extent to which items function differently across the sub-groups of students. For the past several years, interest has been demonstrated in the study of differential item functioning (DIF). DIF is investigated whenever one wants to identify items on which two groups of examinees, matched on a measure of an appropriate variable, do not perform the same. Motivation for studying DIF could stem from psychometric considerations or from broader issues having to do with pedagogical, social, or psychological questions. The purpose of this study is to help ensure that strategies for differential item functioning (DIF) detection for students with disabilities are appropriate and lead to meaningful results. We surveyed existing DIF studies for students with disabilities and describe them in terms of study design, statistical approach, sample characteristics, and DIF results. Based on descriptive and graphical summaries of previous DIF studies, we make recommendations for future studies of DIF for students with disabilities.

Key words: Differential Item Functioning (DIF), Measuring, Students with Disabilities.

Language: English

Citation: Ameneh H (2017) A CONFIRMATORY SURVEY OF DIFFERENTIAL ITEM FUNCTIONING. ISJ Theoretical & Applied Science, 04 (48): 1-7.

Soi: <http://s-o-i.org/1.1/TAS-04-48-1> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.1>

Introduction

Differential item functioning (DIF) has generated great interest in language testing applications (see Holland & Wainer, 1993; Penfield & Camilli, 2007). Rezaee & Shabani mentioned that researchers believe that through the use of DIF detection methodologies, factors contributing to group differential performance could be revealed, items flagged for DIF could be discarded, and finally fairer decisions could be made (Pae, 2004a; Rezaee & Shabani, 2010). Differential item functioning (DIF) refers to group differences in performance on a test item that cannot be explained by group differences in the construct targeted by the item (Crocker & Algina, 1986; Clauser & Mazor, 1998). Test items are identified as exhibiting DIF when, after matching examinee groups by a measure of ability, the performance of one group is significantly higher than the other group, on average. When DIF is found to occur, it means that a test item is measuring traits or abilities that are secondary to the targeted ability. For students with disabilities, such secondary

traits could be a test taker's ability to access the math content in a word problem or the ability to respond to a computer-delivered constructed response item with a keyboard, for example. For such students, opportunity to learn the content may also be considered a secondary trait. Secondary traits measured by items showing DIF may be relevant or irrelevant to the targeted ability. When test items measure secondary traits or abilities that are irrelevant to the intended measure for some groups, such items are considered biased. Item bias is one aspect of fairness in testing and test use (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education (1999). To ensure test fairness, DIF statistical methodology is used to empirically identify items that are performing differently across focal and reference groups after matching examinees based on ability, and human judgment is used to decide whether an item showing DIF is biased based on its characteristics (Zieky, 1993; Zumbo, 1999). When an item shows moderate to high levels of DIF, the item is typically reviewed



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

by content experts. In the test development stage, an item showing DIF may either remain as is, be revised, or be deleted from the item pool. While small sample sizes had limited the number of DIF studies for students with disabilities historically, recent changes have provided opportunities to conduct item-level analyses and to make judgments about fairness for more specific disability subgroups.

Significant of the Study

Identifying the causes of DIF is also important part to understand about the relative strength and weakness of the examinee groups on the different skills and abilities that the test items measure. Some possible sources for such trends may include item content, item type or format, item context, content and cognitive dimensions associated with items. It may be possible to gain considerable insight into the potential causes of DIF by considering the statistical evidence of item level DIF in light of such item attributes. Practically, items identified as showing substantial DIF are not necessarily deleted from future tests, but these items are among those that need to be carefully reviewed prior to any subsequent use. Holland & et al indicated that by the widespread concern over differential item functioning most standardized testing programs place considerable importance on issues equity and fairness. For many testing programs, DIF analyses are a routine component of general item analyses, and items with unacceptable DIF statistics may undergo extensive sensitivity review or be rejected from operational use. DIF analyses are undertaken to identify items that unfairly advantage one or more examinee subgroups. DIF analyses differ from studies in that the former attempt to control for the effects of subgroup differences in the ability being measured whereas the latter ignore such factors. Most DIF approaches are best considered as global in that the resulting statistic is an index that somehow combines information across all ability ranges and provides an omnibus examination. (Holland & Thayer, 1988). CDIF is rather unique since CDIF values add up to the total DTF, enabling the practitioners to examine the net effect of deleting one or more items from the test. Although the DFIT framework has shown to be an effective mechanism for detecting DIF and DTF in IRT-based tests/questionnaires in several studies (e.g., Flowers et al., 1999; Oshima et al., 1997; Raju et al., 1995), these studies also have pointed out a need for better procedures for assessing the statistical significance of the DIF and DTF indices.

What is DIF?

Mellenbergh explained that Differential Item Functioning (DIF) occurs when an item on a test functions differently for different groups, given the ability level. Usually the groups are called reference group and focal group, and DIF means that the item has different characteristics for the different groups. Usually two types of DIF are distinguished: uniform DIF and non-uniform DIF (Mellenbergh, 1982). Hambleton arranged that Non-uniform DIF can be split into two types (crossing and non-crossing) and occurs when there is an interaction between group membership and ability level. In crossing non-uniform DIF, for one end of the ability level spectrum the item is easier for members of one group, whereas at the other end of the ability level the item is easier for members of the other group. In non-crossing non-uniform DIF, the item is of similar difficulty for both groups at one end of the ability spectrum, but different difficulties for the groups at the other end of the ability spectrum. Hambleton believed that in an IRT framework this means that the a-parameter and the b-parameter are different. Although in general uniform DIF is the most common type of DIF, previous applied research has found non-uniform DIF in operational tests as well (e.g. Hambleton and Rogers, 1989). Therefore just testing for uniform DIF is insufficient. Guler described that one issue in the detection of DIF is the presence of impact. When the focal group and reference group differ in their underlying ability distribution, i.e. when one group has a higher average ability than the other group, this is called impact. The presence of impact can make the detection of DIF more difficult (e.g. Guler and Pen_eld, 2009). Regardless of the type of DIF, the issue is that the item does not function the same for members of different groups, which can make a test unfair if the item is treated as functioning the same in both groups. Graphical Differential Item Functioning Several DIF approaches have straightforward graphical interpretations. Within the context of item response theory (IRT), DIF is conceptualized as differences between the item characteristic curves (ICCs) for two groups receiving the same item. It is not surprising that several IRT-based DIF approaches are graphical in nature. For instance, several authors have suggested DIF measures that are based on the area separating ICCs (e.g., Raju, 1988; Rudner, Getson, & Knight, 1980). Such measures can often be represented as shading on a plot of the two ICCs. Thissen and Wainer (1990) focused on the calculation of confidence bands around individual ICCs, but they described how these bands could be calculated separately for two subgroups and then visually compared as a DIF measure. The authors use a sampling approach based on multiple imputations to approximate the variability around an individual

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

ICC, and they derived relationships between the number of samples taken and the confidence associated with the resulting confidence bands. Pashley (1992) took an additional step and provided a method for calculating exact confidence bands around the difference function directly. The resulting function could be examined to identify locations of local DIF, ranges for which the confidence bands do not include zero. Pashley's work builds upon the work of Hauck (1983) on methods for calculating confidence bands for logistic regression lines. Hauck provided closed-form expressions for the confidence bands using Scheffe's method and a form of the Cauchy-Schwartz inequality. Both the Rasch and two-parameter-logistic (2PL) IRT models are logistic response curves, so Hauck's approach can be applied directly in these cases.

DIF Procedure and Limitations

Incipient procedures for assessing DIF focused on dichotomous items (Camilli & Shepard, 1994; Holland & Wainer, 1993; Penfield & Camilli, 2007; Roussos & Stout, 2004). Tests of DIF in polytomous items address whether individuals having the same level of proficiency, but belonging to different groups, have the same chance of obtaining each score level of the polytomous response variable. A limitation of traditional measures of DIF for polytomous items is that they provide only an item-level index of the DIF effect (or an item-level test of the null hypothesis of no DIF) and thus provide no information concerning which score levels are implicated in the DIF effect or whether some score levels are implicated more than others. For this reason, traditional DIF measures for polytomous items can be conceptualized as omnibus measures of DIF. Because omnibus measures of DIF provide no information concerning which score levels are manifesting the DIF effect, they provide limited information to help guide the identification of specific components of the item manifesting the DIF effect and the potential causes of the DIF effect. The limitations of omnibus DIF measures make clear the need for a DIF methodology that examines measurement equivalence in relation to each score level of the polytomous item. The probability of observing each score level of a polytomous item is defined according to a series of step functions describing the chance that an individual will progress, or step, from one score level to a higher score level (e.g., the step from a score of 1 to a score exceeding 1, the step from a score of 2 to a score exceeding 2, etc.). It is the properties (i.e., underlying parameters) of these step functions that ultimately dictate the probability of observing each score level for an individual with a particular level of ability (Baker, 1992). As a result, an examination of the between-group difference in measurement properties

in relation to each score level can be pursued through an examination of the between-group difference in the properties of the step functions underlying the polytomous item. This framework has been referred to as differential step functioning (DSF; Penfield, 2006, 2007). The framework of DSF provides a mechanism for examining the between-group difference in measurement properties at each step, thus providing detailed information concerning where along the polytomous response process a lack of measurement equivalence may exist for the groups under consideration. The framework of DSF provides DIF analysts with several advantages over the omnibus measures of DIF. First, tests of measurement invariance based on the DSF effects can be more powerful than the omnibus DIF tests when the magnitude and/or sign of the DSF effect varies across the steps of the underlying polytomous response variable (Penfield, 2006, 2007). In the extreme case where the sign of the DSF effect changes across the steps (i.e., is positive for one step but negative for another), the power of DSF-based tests of invariance has been shown to be more than 10 times that of the omnibus tests of DIF (i.e., a power of .045 for the omnibus test of DIF compared with a power of .85 for the test of DSF; Penfield, 2006). A second advantage of the DSF framework is that it allows the DIF analyst to pinpoint precisely which score levels (or steps) are responsible for an observed DIF effect. That is, if a polytomous item is flagged for DIF, then the analysis of DSF can be used to isolate the components of the item that require further content review and possible revision and ultimately suggest the factors causing the DIF. Because the identification of the causes of DIF is the key to decisions about item revision and/or removal (Bolt, 2000; Douglas, Roussos, & Stout, 1996; Gierl & Khaliq, 2001; Oshima, Raju, Flowers, & Slinde, 1998; Scheuneman, 1987; Schmitt, Holland, & Dorans, 1993; Swanson, Clauser, Case, Nungester, & Featherman, 2002), the framework of DSF can play a pivotal role in such decisions. In addition, the growing interest in the consideration of cognitive strategies used in responding to items (DiBello, Roussos, & Stout, 2007; Leighton & Gierl, 2007; Mislevy, 2006) places a new emphasis on understanding between-group differences in measurement properties in relation to these strategies. DSF provides a mechanism for identifying between-group differences in strategies underlying the responses to polytomous items. To date, the only accounts of DSF and related methodology have been technical and have provided limited guidance on the use and interpretation of DSF results. In this article, we present a nontechnical overview of the DSF framework and available methodology for assessing DSF and provide recommendations for the use and interpretation of DSF analyses. Issues of particular importance include: (a) how the results of a DSF

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHIQ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

analysis can help target investigations into the causes of DIF, (b) what methods can be used to evaluate DSF, (c) what criteria should be used to flag large DSF magnitudes, and (d) how DSF analyses can be most effectively used in conjunction with traditional DIF analyses. In addition, we illustrate the use of DSF using a real data set.

Differential Item Functioning (DIF) Analysis

For a test item to display DIF implies a persistent interaction between the performance of a subgroup of test takers and an attribute (e.g., age, gender, race, or nationality), which would give an unfair advantage to that subgroup over another (see Kunnan, 1990; Zeidner, 1986, 1987). To meaningfully impact test scores, this interaction must be not only too improbable to be attributable to chance but substantive as well. Statistically significant DIF indices may nevertheless be too small in magnitude to have any meaningful effect on the measurement (Linacre, 2010 a). Therefore, to cause test bias, DIF must be statistically significant ($p < .05$), substantively impact observed test or test item performance, and have a theoretically sound cause. Significant and substantive DIF indices imply that test scores no longer represent only the intended latent variable; they also represent an unintended and unmodeled secondary dimension (Wright & Stone, 1988). Unmodeled secondary dimensions may be either simple or complex (Jang & Roussos, 2009). The presence of a simple secondary dimension indicates that most test items measure the intended trait but that a group of items measures a secondary attribute that is nevertheless targeted on the intended trait. These items form an “auxiliary dimension” (Jang & Roussos, 2009, p. 242). The presence of a complex secondary dimension means that test items measure unintended traits, whose degree and type differs from item to item (Jang & Roussos, 2007, 2009). In tests with complex secondary dimensions, test items have primary and auxiliary dimensions, which measure the latent trait, and at least one “nuisance dimension,” which does not (Jang & Roussos, 2009, p. 242). Ackerman, Gierl, and Walker (2003) referred to DIF caused by auxiliary dimensions as *benign* and that caused by nuisance dimensions as *adverse*. This study adopts Rasch-based DIF analysis; one of the most frequently used methods of DIF analysis. Wyse and Mapuranga (2009) argued that the Rasch method is broadly comparable to other methods and Cauffman (2006) and Edelen, McCaffrey, Marshal, and Jaycox (2009) have reported on the potential of the method to detect gender-based DIF in educational assessment. Ferne argued that Rasch-based DIF analysis has two preconditions: (a) unidimensionality, which holds when overall test scores are not contaminated by any irrelevant factor, and (b) local independence, which

holds when test takers’ performance on a given test item is not influenced by their performance on another item (Ferne & Rupp, 2007). Dimensionality analysis and DIF analysis are conceptually distinct. Dimensionality analysis yields information about secondary dimensions that are relevant to *all* test takers, whereas DIF analysis identifies conditional differences in response probabilities using defined variables (such as gender) that dimensionality analysis does not examine. Roussos and Stout (1996, 2004) argued that although the presence of DIF points to multidimensionality, “the presence of a secondary dimension does *not* automatically imply the presence of DIF. Some secondary dimensions cause DIF and some do not, depending on how the reference and focal groups differ in their proficiency on the secondary dimension” (Roussos & Stout, 2004, p. 108). Because of these distinctions, dimensionality analysis is an important precondition to Rasch-based DIF analysis (Ferne & Rupp, 2007, p. 129). Unfortunately, only eight of 27 studies in Ferne and Rupp’s survey of DIF analysis in language assessment provided evidence of unidimensionality. As previously discussed, DIF can be classified as either UDIF or NUDIF (Ferne & Rupp, 2007). UDIF indicates that the subgroup differences in the secondary dimension are constant across the main dimension and that “there is no interaction between ability level and group membership” (Prieto Maranon, Barbero Garcia, & San Luis Costas, 1997, p. 559). This implies that the item characteristic curves (ICCs) of two subgroups have identical slopes but different intercepts, indicating a consistent difference across the two subgroups (e.g., male and female), irrespective of the subclass being examined (e.g., low- or high-ability test takers). NUDIF, conversely, does vary with the ability level of test takers. In other words, the difference in performance between two subgroups is not consistent between subclasses of those subgroups.

DIF on the CLBA

Once a differential item functioning (DIF) item has been identified, little is known about the examinees for whom the item functions differentially. This is because DIF focuses on manifest group characteristics that are associated with it, but do not explain why examinees respond differentially to items. Ethnic, cultural, disability, and/or linguistic groups, little progress has been made in explaining why differential item functioning (DIF) occurs in many statistically flagged items. Because researchers’ attempts to understand the “underlying causes of DIF using substantive analyses of statistically identified items have, with few exceptions, met with overwhelming failure” (Roussos and Stout, 1996, p. 360), Roussos and Stout (1996) proposed a confirmatory approach to DIF.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHIQ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

A Confirmatory Approach to DIF

The Douglas, Roussos, and Stout (1996) confirmatory approach to DIF is a two-stage approach designed to link substantive and statistical methods in a DIF analysis framework. In the first stage of this framework, DIF hypotheses are generated from theory and substantive item analyses are conducted to classify the items according to an *organizing principle* or theoretical framework. A DIF hypothesis specifies whether an item or bundle of items designed to measure the *primary* or intended dimension also measures a *secondary* dimension or unexpected dimension that is suspected of producing DIF/DBF. The second stage in the DIF analysis framework involves statistically testing the hypotheses generated in stage one of the analyses. The statistical procedure and commercial software package selected for testing the hypotheses in the current study is the Simultaneous Item Bias Test (Stout and Roussos, 1999).

Differential Item Functioning (DIF) and Bias

In order to investigate the research questions, the current study drew on differential item functioning (DIF), a common approach used in the language testing literature to investigate bias. Differential item functioning is generally defined as existing when two groups of test-takers, who are otherwise matched in ability on a construct, have different probabilities of answering an item correctly (see Ferne & Rupp, 2007). A DIF finding, which in essence signifies the advantage of one group over another, may be attributed to the influence of construct-irrelevant variance on the studied item (and so indicate 'item bias'). On the other hand, two groups may differ in a construct-relevant way, in which case DIF may indicate impact rather than bias. DIF is therefore regarded as 'a necessary but not sufficient condition' for establishing an argument for bias (McNamara & Roever, p. 83). Various procedures have been used to calculate DIF, and according to McNamara and Roever (2006) these can be classified into four categories: analyses based on item difficulty, nonparametric approaches, item response theory (IRT) approaches, and 'other' approaches (such as logistic regression). These approaches have emerged more or less chronologically, with item difficulty approaches often found in early DIF studies, and IRT and logistic regression appearing more recently. Each 'family' of approaches has different strengths and assumptions. Ferne and Rupp (2007) suggest that a variety of methods is necessary as some studies have shown that certain methods may produce conflicting results for the same items (see, e.g., Kristjansson,

Aylesworth & McDowell, 2005). Thus, multiple methods for DIF detection were selected for this study. Due to limitations in the sample size 2- or 3-parameter IRT approaches were not suitable (see McNamara & Roever, 2006). The two DIF detection procedures chosen as methods for the current study were the standardization procedure (also known as conditional p value) (Dorans & Kulick, 1983) and the Mantel-Haenszel procedure (Dorans, 1989; Mantel & Haenszel, 1959). Both procedures involve a comparison between a 'reference group' and a 'focal group'. The focal group is considered the 'group of interest', and the reference group is the group with whom performance is being compared (Holland & Wainer, 1993, p. xv). The standardization and Mantel-Haenszel procedures also involve matching test-takers on ability level; and each allows for matching to be performed using an external criterion. The selection of these two procedures reflects the approach taken by Roever (2007) in which both methods used together were found to be complementary, and useful for investigations with relatively small sample sizes (e.g. 250). Similarly, Hambleton (2006, p. 186) recommends these two procedures for identifying DIF with limited numbers of test-takers.

Using the Pattern of DSF Effects to Help Identify the Cause of DIF

As described in the previous sections, the presence of a DSF effect in a particular step can help the DIF analyst in targeting the specific score levels manifesting a potentially biasing factor. We can, however, make even more use of the DSF effects in understanding the causes of DIF through an analysis of the pattern of the DSF effects across the *J* steps of the polytomous item. In particular, the specific pattern of the DSF effects across the *J* steps of the polytomous item can help guide the analyst in identifying the possible cause(s) of the DIF effect and in making a decision about item revision or removal. Although there are an infinite number of patterns that the *J* DSF effects can assume, several general groupings of patterns are particularly revealing of the causes of the DIF effect. Penfield, Alvarez, and Lee (2009) described these groupings within a two-dimensional taxonomy of DSF patterns. The first of these dimensions distinguishes between pervasive and nonpervasive DSF. Pervasive DSF is observed when all *J* steps display a substantial DSF effect, and thus the DSF effect is *pervasive* across all score levels. The presence of pervasive DSF suggests to the analyst that the cause of DIF is exerting its influence at the item level. For example, pervasive DSF may be observed in a writing task where students are asked to respond to a particular prompt. In such an item, the presence of pervasive DSF would imply that the factor responsible for the lack

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

of invariance is inherent in the content of the prompt itself. In contrast, nonpervasive DSF exists when only one or a few steps display a substantial DSF effect. The presence of nonpervasive DSF implies that the factor causing DIF may be isolated to one or a few steps. For example, consider a writing task in which DSF appears only in a score level that requires well-structured paragraphs, in addition to the characteristics required by the scoring criteria for the lower score levels. In this case, the nonpervasive DSF provides evidence that the DIF effect is not necessarily due to content in the writing prompt but rather is isolated to properties of the particular level pertaining to paragraph structure. Making this distinction between pervasive and nonpervasive DSF can prove valuable in determining whether the cause of DIF is due to an item level property or a property of one or more particular score levels. The second dimension of the DSF taxonomy pertains to the consistency of the DSF effects across impacted steps, distinguishing between constant, convergent, and divergent forms of DSF. Constant DSF is observed when the steps displaying a DSF effect are relatively equal in magnitude and sign. Although constant pervasive DSF provides evidence that the factor responsible for the DSF effect is a property of the item, constant nonpervasive DSF indicates the factor responsible for the DSF is restricted to the affected score levels and thus is not necessarily an item-level property. Convergent DSF describes the situation in which affected steps display a DSF effect of the same sign (i.e., favoring the same group) but different magnitude, providing evidence that the causal factors are manifested differentially across steps. It may be the case that an item-level effect impacts score levels differently, or more than one biasing factor is present. Divergent DSF is characterized by affected steps displaying opposite signs, meaning that the

relative advantage shifts between groups across the steps. The presence of divergent DSF implies that the causes of the DSF effects are different for the affected score levels, and thus more than one causal property is at play. Identifying the presence of divergent DSF is of paramount importance because many DIF statistics are expected to be relatively insensitive when divergent DSF effects cancel one another at the item level, yielding a net DIF effect near zero.

Conclusion

Since the 1980s, the popularity of mixed effects or multilevel models has increased exponentially in several research domains, for example, in education, psychology, and biomedical sciences. Also in IRT applications, mixed (see, e.g., Adams, Wilson, & Wu, 1997; De Boeck & Wilson, 2004; Kamata, 2001; Mellenbergh, 1994). Furthermore, item response models can include random item effects (crossed with the random person effects), as discussed by Van den Noortgate et al. (2003). These important evolutions in item response modeling suggest new models and approaches for DIF. Traditionally, an item is said to show DIF if conditionally on the ability, the probability of correctly answering the item depends on the group the person belongs to and models and techniques for DIF treat both the items and the groups as fixed. Although in traditional DIF analyses DIF is considered specific and limited, this is not true if items or groups are considered random, a possibility that is explicitly mentioned in the taxonomy. For example, the effect of fixed groups may be modeled as varying at random over items, following a normal distribution.

References:

1. Abedi J, Leon S, Kao JC (2008) Examining differential item functioning in reading assessments for students with disabilities (CRESST Report No. 744). Los Angeles, CA: UCLA.
2. Bock R, Muraki E, Pfeifferberger W (1988) Item pool maintenance in the presence of item parameter drift. *Journal of Educational Measurement*, 25, 275–285.
3. Bradley J (1978) Robustness? *British Journal of Mathematical and Statistical Psychology*, 31, 144–152. doi:10.1111/j.2044-8317.1978.tb00581.x
4. Chan KY, Drasgow F, Sawin LL (1999) What is the shelf life of a test? The effect of time on psychometrics of a cognitive ability test battery. *Journal of Applied Psychology*, 84, 610–619. doi:10.1037/0021-9010.84.4.610
5. Cho SJ, Cohen AS (2010) A multilevel mixture IRT model with an application to DIF. *Journal of Educational and Behavioral Statistics*, 35, 336–370. doi:10.3102/1076998609353111
6. Cohen AS, Bolt DM (2005) A mixture model analysis of differential item functioning. *Journal of Educational Measurement*, 42, 133–148. doi:10.1111/j.1745-3984.2005.00007



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

- Cohen AS, Kim SH (1992) Detecting calculator effects on a standardized mathematics test. Madison: University of Wisconsin-Madison, Center for Placement Testing.
- DeCarlo LT (2012) Recognizing uncertainty in the Q-matrix via a Bayesian extension of the DINA model. *Applied Psychological Measurement*, 36, 447-468. doi:10.1111/j.1745-3984.2011.00143.x
- Donoghue JR, Holland PW, Thayer DT (1993) A Monte Carlo study of factors that affect the Mantel-Haenszel and standardization measures of differential item functioning. In P. W. Holland & H. Wainer (Eds.), *Differential item functioning: Theory and practice* (pp. 137-166). Hillsdale, NJ: Erlbaum.
- Holland PW, Thayer DT (1988) Differential item performance and the Mantel-Haenszel procedure. In H. Wainer & H. Braun (Eds.), *Test validity* (pp. 129-145). Hillsdale, NJ: Erlbaum.
- Johnson E, Allen NL (1992) The NAEP 1990 technical report (Tech. Rep. No. 21-TR-20). Princeton, NJ: Educational Testing Service.
- Kim SH, Cohen AS (1991) A comparison of two area measures for detecting differential item functioning. *Applied Psychological Measurement*, 15, 269-278.
- Lewis C, Sheehan K (1990) Using Bayesian decision theory to design a computer-ized mastery test. *Applied Psychological Measurement*, 14, 367-386.
- Lord FM (1980) Applications of item response theory to practical testing problems. Hillsdale, NJ: Erlbaum.
- Mantel N, Haenszel W (1959) Statistical aspects of the analysis of data from retrospective studies of disease. *Journal of the National Cancer Institute*, 22, 719-748.
- Nelson J, Zwick R (1989) The Mantel-Haenszel delta difference statistic and its standard error under complex sampling. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA.
- Raju NS (1988) The area between two item characteristic curves. *Psychometrika*, 1989, April, 53, 495-502.
- Samejima F (1997) Graded response model. In W. V. van der Linden and R. K. Hambleton (Eds.), *Handbook of modern item response theory* (pp. 85-100). New York: Springer.
- Swaminathan H, Rogers HJ (1990) Detecting differential item functioning using logistic regression procedures. *Journal of Educational Measurement*, 27, 361-370.
- Tarone RE, Gart JJ, Hauck WW (1983) On the asymptotic inefficiency of certain noniterative estimators of a common relative risk or odds ratio. *Biometrika*, 70, 519-522.
- Thompson WA (1977) On the treatment of grouped observations in life studies. *Biometrics*, 33, 463-470.
- Welch C, Hoover HD (1993) Procedures for extending item bias detection techniques to polytomously scored items. *Applied Measurement in Education*, 6, 1-19.
- Yanagawa T, Fuji Y (1990) Homogeneity test with a generalized Mantel-Haenszel estimator for L 2 x K contingency tables. *Journal of the American Statistical Association*, 85, 744-748.
- Zieky M (1993) Practical questions in the use of DIF statistics in item development. In P. W. Holland & H. Wainer (Eds.), *Differential item functioning* (pp. 337-364). Hillsdale, NJ: Erlbaum.
- Zwick R, Donoghue JR, Grima A (1993) Assessment of differential item functioning for performance tasks. *Journal of Educational Measurement*, 1993a, 30, 233-251.
- Zwick R, Donoghue JR, Grima A (1993) Assessing differential item functioning in performance tests (ETS Research Rep. No. 93-14). Princeton, NJ: Educational Testing Service. 1993b.
- Zwick R, Thayer DT (1996) Evaluating the magnitude of differential item functioning in polytomous items. *Journal of Educational and Behavioral Statistics*, 21, 187-201.



Impact Factor:

ISRA (India) = 1.344
ISI (Dubai, UAE) = 0.829
GIF (Australia) = 0.564
JIF = 1.500

SIS (USA) = 0.912
ПИИИ (Russia) = 0.234
ESJI (KZ) = 3.860
SJIF (Morocco) = 2.031

ICV (Poland) = 6.630
PIF (India) = 1.940
IBI (India) = 4.260

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 10.04.2017 <http://T-Science.org>

SECTION 7. Mechanics and machine construction.

Dossymbek Jakiyayev

Associate Professor, Ph.D.,
Head of the department «Mechanics and Engineering»
Taraz State University named after M.Kh.Dulati,
Kazakhstan
kaf_mim206@mail.ru

Sagat Zhunisbekov

doctor of technical Sciences, Professor, academician of
the National Engineering Academy of the Republic of
Kazakhstan, Professor of the Department «Mechanics and
Engineering», Taraz State University named after
M.Kh.Dulati, Kazakhstan
tar-ti@mail.ru

Bauyrzhan Jakiyayev

Teacher, master
Taraz State University named after M.Kh.Dulati,
Kazakhstan
kaf_mim206@mail.ru

THE PREDICTION OF DURABILITY OF STEEL STRUCTURAL ELEMENTS IN COMPLEX HETEROGENEOUS STRESS STATE

Abstract: The article presents a statistical model of many-cycle fatigue of structural elements, which is generalized to any complex heterogeneous stress state under the General conditions of nonstationary loading.

Key words: cyclic loading, durability, complex nonuniform stress state.

Language: Russian

Citation: Jakiyayev D, Zhunisbekov S, Jakiyayev B (2017) THE PREDICTION OF DURABILITY OF STEEL STRUCTURAL ELEMENTS IN COMPLEX HETEROGENEOUS STRESS STATE. ISJ Theoretical & Applied Science, 04 (48): 8-14.

Soi: <http://s-o-i.org/1.1/TAS-04-48-2> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.2>

УДК 539.385

ПРОГНОЗИРОВАНИЕ ДОЛГОВЕЧНОСТИ СТАЛЬНЫХ КОНСТРУКЦИОННЫХ ЭЛЕМЕНТОВ ПРИ СЛОЖНОМ НЕОДНОРОДНОМ НАПРЯЖЕННОМ СОСТОЯНИИ

Аннотация: В статье рассмотрена статистическая модель многоциклового усталости конструктивных элементов, которая обобщена на любое сложное неоднородное напряженное состояние при общих условиях нестационарного нагружения.

Ключевые слова: циклическое нагружение, долговечность, сложное неоднородное напряженное состояние.

Введение

Вопросы оценки многоциклового усталостных повреждений элементов конструкций и деталей машин в условиях сложного напряженного состояния и нестационарного нагружения являются наиболее сложными. Традиционные расчеты на усталость основаны на сравнении напряжений в наиболее опасных точках конструкции с пределом выносливости материала, найденном путем испытаний лабораторных образцов. Слабые стороны такого подхода к оценке сопротивления усталости известны давно. В зонах высоких градиентов напряжений мы недооцениваем

сопротивление конструкции, а в случае малых градиентов, но больших физических объемов (намного превышающих объемов используемых лабораторных образцов) наоборот переоцениваем. Для того, чтобы результаты расчета приближались к действительности, были созданы полуэмпирические приемы корректировки расчетных данных, связанные со введением эффективных коэффициентов концентрации напряжений и масштабных коэффициентов. Эти приемы могут быть использованы в частных случаях, а в самом общем случае конструкции, работающей в произвольном напряженном состоянии, они не



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	ПИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

применимы. Осознание этого факта привело к появлению статистических моделей усталостного разрушения, позволяющих в принципе учесть теоретически как влияние градиентов напряжений, так и влияние абсолютных размеров детали. Один из практически удобных вариантов статистического расчета, связанного в первую очередь с работами В. П. Когаева и некоторых других исследователей, введен в ГОСТ 25.504-82. Этот метод основан на модели слабого звена по Вейбуллу. Указанный метод успешно обслуживает расчеты стержневых конструктивных элементов с различными концентраторами напряжений, а также в значительной степени и расчеты пластин и оболочек с отверстиями, работающих в безмоментном напряженном состоянии, так как в зоне концентрации напряжений около отверстия всегда доминирует одно главное напряжение.

Лежащая в основе этого метода статистическая теория подобия и известные вероятностные методы расчета на усталость при однопараметрическом и двухпараметрическом напряженном состоянии связаны в общем случае с рядом допущений, таких как учет при вычислении критерия подобия в условиях сложного напряженного состояния только первого главного напряжения, независимость формы критерия подобия от механических свойств материала детали и образцов, возможность раздельного определения критериев подобия по нормальным и касательным напряжениям в случае одновременного изгиба и кручения вала, возможность раздельного определения эквивалентных режимов нагружения по нормальным и касательным напряжениям в указанном случае вала, если нагружение является нестационарным. Эти допущения вносят в расчет определенные погрешности, которые проявляются в различной степени в зависимости от вида циклического напряженного состояния и характера нагружения.

В данной работе дано обобщение статистической модели многоциклового усталости конструктивных элементов, лежащей в основе ГОСТа 25.504-82, на любое сложное неоднородное напряженное состояние при общих условиях нестационарного циклического нагружения.

Материалы и методы

Для прогнозирования распределения долговечности конструктивного элемента, работающего при сложном напряженном состоянии и нестационарном нагружении, применима детерминированная энергетическая модель усталостного разрушения элемента материала, предложенная в работах [1,2]. Эта модель используется в сочетании со

статистической моделью Вейбулла [3]. В указанных работах построено энергетическое уравнение многоциклового усталостного повреждения, имеющее в общем случае следующий вид

$$P(N) = \frac{\sigma_{max}(N)}{\bar{\sigma}_p} + \sum_{k=1}^N Y(H_k, R_k), \quad (1)$$

где $P(N)$ - поврежденность, накопившаяся к N -му циклу нагружения; $\sigma_{max}(N)$ - максимальное напряжение цикла на момент определения P ; $\bar{\sigma}_p$ - истинное сопротивление разрыву; R_k - коэффициент асимметрии k -го цикла; H_k - безразмерный параметр, зависящий от необратимой работы деформирования, совершаемой в каждом цикле нагружения.

Данное кинетическое уравнение основано на гипотетической модели материала, связь параметров которой с реальным материалом осуществляется через экспериментальные кривые усталости. По кривым усталости заданных вероятностей разрушения могут быть построены графики функции $\varphi(H, R)$, отвечающее тем же вероятностям разрушения. Это обстоятельство используется в дальнейшем при построении статистической модели усталостного разрушения [4,5,6,7,8,9,10], основанной на данной детерминированной модели усталостного разрушения элемента материала и статистической теории «слабого звена» по Вейбуллу.

В теории Вейбулла предполагается, что разрушения в ряде единичных объемов V_0 являются независимыми событиями и вероятность разрушения в объеме V_i , на которые разбиваются весь объем детали, определяется по формуле

$$P_i = 1 - (1 - P_0)^{V_i/V_0}, \quad (2)$$

где P_0 - вероятность разрушения единичного объема V_0 . Объем V_i должен быть достаточно малым для того, чтобы считать напряженное состояние в его пределах однородным. Тогда вероятность разрушения в объеме всей детали V находится по формуле

$$P_V = 1 - \prod_{i=1}^n (1 - P_i), \quad (3)$$

где n - количество объемов V_i в объеме детали.

Impact Factor:

ISRA (India) = 1.344
ISI (Dubai, UAE) = 0.829
GIF (Australia) = 0.564
JIF = 1.500

SIS (USA) = 0.912
РИИЦ (Russia) = 0.234
ESJI (KZ) = 3.860
SJIF (Morocco) = 2.031

ICV (Poland) = 6.630
PIF (India) = 1.940
IBI (India) = 4.260

Сформулируем особенности предложений статистической модели усталостного разрушения. При детерминированном напряженном состоянии параметры N и R являются также детерминированными величинами. Однако функция $\varphi(\chi, R)$ не является детерминированной, а зависит еще и от заданной вероятности разрушения. Поврежденность в единичном объеме определяется как функция заданной вероятности по формуле (1). Если при $P = 1$ дана долговечность N_p , то получается зависимость, по которой можно подобрать вероятность разрушения в единичном объеме. Вероятность разрушения в условной ячейке, объем которой может быть меньше или больше единичного находится по формуле (2), а вероятность разрушения всей детали по формуле (3).

Для построения кривой распределения долговечности конструкционного элемента, работающего в сложном неоднородном напряженном состоянии, необходимо прежде всего располагать данными о сопротивлении материала в линейном однородном напряженном состоянии. Эти исходные данные получают путем испытаний на усталость гладких цилиндрических образцов при растяжении – сжатии с различными коэффициентами асимметрии цикла. Объем материала, находящегося в зоне разрушения, принимается за единичный V_0 . На основании этих кривых равных вероятностей усталостного разрушения цилиндрических образцов строятся графики функции $\varphi(H, R)$, относящиеся к единичному объему материала V_0 и отвечающие тем же вероятностям разрушения.

Алгоритм расчета на усталость конструкций, работающих при сложном неоднородном напряженном состоянии в самых общих условиях циклического нестационарного нагружения, представляется в следующем виде. Расчет начинается с определения напряженного состояния конструкции, зависящего от одного или нескольких параметров нагрузки, изменяющихся во времени по индивидуальным циклическим законам. Однако на режим нагружения накладывается то ограничение, что

весь режим нагружения может быть разбит на блоки одинаковых циклов.

Если для расчета напряжений используется некоторый способ дискретизации сплошного тела, например МКЭ, то одновременно с напряжениями в каждой ячейке находятся приведенный коэффициент асимметрии R_{np} и величина H .

Для наиболее напряженной области конструкции определяется градиент величины H

$$G_H = \sqrt{\left(\frac{\partial H}{\partial x}\right)^2 + \left(\frac{\partial H}{\partial y}\right)^2 + \left(\frac{\partial H}{\partial z}\right)^2}, \quad (4)$$

и по этому градиенту находятся оптимальные (по составлению с экспериментальными данными) размеры, используемые в расчетах на усталость. Если найденные оптимальные размеры ячейки не совпадают с теми размерами, которые использовались в расчетах напряжений, то производится повторная разбивка конструкции на ячейки оптимальных размеров. В том случае, когда в расчетах на усталость применяются экстраполяция размеров ячейки на ноль, выбор оптимальных размеров ячейки не нужен. Расчеты на усталость производятся при двух любых размерах ячейки, одним из которых может быть тот, который применялся в расчете по МКЭ.

Далее устанавливается напряженное состояние для центра каждой ячейки, используемой в расчетах на усталость, и для этой ячейки находятся значения N и R_{np} на каждой ступени нагружения.

Дальнейшие расчеты направлены на построение кривой распределения долговечности конструкции. Выбирается наиболее напряженная ячейка, т.е. та, для которой величина N является максимальной, и задавая некоторую вероятность разрушения P_0 , определяется величина $\varphi(H, R_{np})$ на каждой ступени нагружения по графикам $\varphi(H, R)$, отвечающим определенным вероятностям разрушения P_0 единичного объема материала V_0 , или из выражения

Impact Factor:

SISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	ПИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

$$\varphi(H, R_{np}) = \left(1 - \frac{(H+2)C_2}{(1-R_{np})\bar{\sigma}_p} \right) B^{-1} \exp \left[\frac{(H+2)^2 C_2^2 a^2 (1+R_{np})}{8\epsilon(1-R_{np})} + \frac{(H+2)C_2 a}{2(1-R_{np})} \right] \sqrt{\frac{(H+2)^2 C_2^2 a^2 (1+R_{np})^2}{16\epsilon^2} + \frac{(\ln A - \ln B)(1-R_{np}^2)}{\epsilon} + (1-R_{np})^2}, \quad (5)$$

где A , B , a и ϵ – параметры, зависящие от вероятности P_0 и описывающие кривую усталости при симметричном цикле.

Вероятность разрушения в этой ячейке находится по формуле (2).

Далее для наиболее напряженной ячейки вычисляется число циклов до разрушения, причем в общем случае сначала находится число целых блоков до разрушения p , для чего служит неравенства

$$\sum_{k=1}^n \varphi(H_k, R_k) \cdot N_k < 1 - \sigma_{max} / \bar{\sigma}_p \quad (6)$$

$$\sum_{k=1}^{n+1} \varphi(H_k, R_k) \cdot N_k > 1 - \sigma_{max} / \bar{\sigma}_p,$$

а затем определяется количество циклов до разрушения в последнем $n+1$ блоке

$$N_{n+1} = \frac{1 - \sigma_{max} / \bar{\sigma}_p - \sum_{k=1}^n \varphi(H_k, R_k) \cdot N_k}{\varphi(H_{n+1}, R_{n+1})} \quad (7)$$

В каждой из остальных ячеек подбирается вероятность разрушения с таким расчетом, чтобы при имеющихся значениях H , R_{np} и $\varphi(H, R_{np})$ на каждый ступени нагружения суммарное число циклов до разрушения каждой ячейки равнялось бы числу разрушающих циклов, найденных для наиболее напряженной ячейки. Вероятность разрушения конструкции при найденном числе циклов до разрушения определяется согласно (3).

Для построения кривой распределения долговечности конструкции при заданном режиме нагружения достаточно определить вероятности разрушения при двух значениях долговечности, отложить величины этих вероятностей и долговечностей на вероятностной сетке, соответствующей распределению Вейбулла, и соединить полученные точки прямой линией.

Особенностью предложенной статистической модели является учет совместного действия этих компонентов циклических напряжений, которые в общем

случае могут изменяться во времени по индивидуальным законам. Примерами напряженного состояния, при котором необходимо учитывать совместное действие всех компонентов напряжений могут служить задача о контакте двух упругих тел и расчет флинцевого соединения. В этих случаях рекомендации существующих методов расчета не находят никакого применения, в то время как предложенная теория позволяет построить статистический расчет на усталость.

С целью экспериментальной проверки статистической модели были поставлены испытания на усталость пластинчатых образцов стали 45 с круглым и эллиптическим отверстиями и испытания на усталость лабораторных образцов той же стали на циклическое растяжение-сжатие. Результаты последних испытаний приняты за базовые при определении сопротивления усталости материала, а результаты испытаний пластин как конструктивных элементов, работающих в сложном неоднородном напряженном состоянии, использованы для сопоставления теории с прямыми опытными данными. Пластинчатые образцы имели ширину 60 мм, отверстие имело диаметр 12 мм, оси эллипса составляли 12 мм и 8 мм. Теоретические коэффициенты концентрации напряжений в области упругого деформирования составляли 2,512 и 3,33 соответственно для крупного и эллиптического отверстия. Эти образцы испытывались на циклическое растяжение-сжатие при стационарном нагружении с коэффициентами асимметрии цикла R , равными $-1,0$ и $-0,3$. При этом фиксировалась долговечность, при которой трещина, возникавшая в устье концентратора, достигала длины 0,3-1,0 мм. При долговечности порядка миллиона циклов опытные и расчетные данные совпадали, если расчет проводился с разбивкой рабочей части образцов с круглым отверстием на ячейки размером 0,5 мм для $R = -1,0$ и 0,7 мм для $R = -0,3$. Для образцов с эллиптическим отверстием указанное совпадение наблюдается при размерах ячейки 0,3 мм для $R = -1,0$ и $R = -0,3$ [11,12].

Уменьшение размеров ячейки до нуля приводит к нижним значениям пределов выносливости, которые, однако, все еще выше расчетной кривой усталости для наиболее

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	РИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

напряженной точки конструкции. При анализе этих результатов следует, прежде всего, отметить, что влияние размеров условных ячеек на расчет долговечностей при заданных вероятностях разрушения в теории подобия, принятой ГОСТом 25.504-82, не рассматривается. Рекомендательный там расчет с нашей точки зрения предполагает экстраполяцию ячеек на ноль. С другой стороны может быть поставлен вопрос: почему в рамках теории Вейбулла наилучшее совпадение с опытом получается при некотором конечном размере ячейки, зависящего к тому же от градиента напряжений. Можно полагать, что тот факт связан с допущением теории о том, что разрушения отдельных элементов материала являются независимыми событиями. Едва ли такое допущение применимо к очень малым объемам. Скорее всего, это можно сказать лишь о каких-то конечных объемах, содержащих достаточное количество кристаллических зерен. С другой стороны объем должен быть настолько мал, чтобы напряженное состояние в его пределах приближенно можно было бы считать однородным.

Так как влияние напряженного состояния на процесс накопления повреждений оценивается в предлагаемой теории параметром N , то и градиенты всех компонентов напряжений естественно оценивать в расчете на усталость градиентом обобщенного параметра N . На основании проведенных опытов в работах [11,12] установлена зависимость оптимальных (по сопоставлению с экспериментальными данными) размеров условной ячейки от градиента напряжений, оцениваемого градиентом параметра N . С уменьшением градиента N влияние задаваемых размеров условной ячейки на расчетные долговечности оказывается достаточно слабой. С уменьшением градиента N влияние задаваемых размеров ячеек стирается.

Таким образом, условие подобия распределений долговечностей двух конструктивных элементов, работающих в различных напряженных состояниях, оказывается в общем случае зависимым от механических свойств материала. Распределение долговечности конструктивного элемента может быть

построено согласно предложенной модели и в общем случае многокомпонентного нестационарного циклического нагружения. Для этого общего случая в известной литературе никаких рекомендаций не содержится.

Сравним результаты расчета эффективных коэффициентов концентрации напряжений, а также данные об оптимальных размерах ячейки с теоретическими и экспериментально-теоретическими рекомендациями различных авторов (см. табл.1).

Заключение

Данные об оптимальных размерах ячейки могут быть сопоставлены с рекомендациями по размерам структурных параметров, введенных некоторыми авторами. Значения структурного параметра, полученные по формулам М. Д. Леонова, В.В. Новожилова, оказываются значительно большими, чем оптимальные размеры ячейки, установленные на основании наших расчетов и опытов. Значения эффективных коэффициентов концентрации напряжений K_{σ} , вычисленные по рекомендациям Г. Нейбера, П. Куна, Р. Петерсона, Р. Хейвуда, В. П. Когаева расходятся между собой не очень сильно. Так для образцов с круглым отверстием наименьшее значение K_{σ} , по Хейвуду расходятся с наибольшим по Петерсону примерно на 20%, для образцов с эллиптическим отверстием – на 28%. Расхождения с нашими экспериментальными и расчетными значениями K_{σ} также не очень велико. Таким образом, в случае концентратора в виде отверстия все указанные рекомендации подтверждаются опытом.

Однако следует иметь в виду, что указанные рекомендации распространяются на случай учета местных напряжений в зоне конструктивного концентратора, где всегда доминирует одно главное напряжение, но не распространяются на общий случай неоднородного напряженного состояния. Отметим также, что перечисленные рекомендации различных авторов никак не учитывают влияние асимметрии цикла нагружения.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	РИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

Таблица 1

Значения эффективного коэффициента концентрации напряжений и структурного параметра материала, определенных по рекомендациям различных авторов.

Авторы рекомендаций	Образцы с круглым отверстием				Образцы с эллиптическим отверстием			
	R = - 1,0		R = - 0,3		R = - 1,0		R = - 0,3	
	K_{σ}	С структурный параметр, мм.	K_{σ}	С структурный параметр, мм.	K_{σ}	С структурный параметр, мм.	K_{σ}	С структурный параметр, мм.
Г. Нейбер	2,180*	0,480	-	-	2,630*	0,480	-	-
П. Кун	2,320*	0,130	-	-	2,910*	0,130	-	-
Р. Петерсон	2,460*	0,210	-	-	3,160*	0,210	-	-
Р. Хейвуд	$\frac{2,200}{*}$ 2,040	0,082	-	-	$\frac{2,670}{*}$ 2,470	0,082	-	-
М.Я. Леонов	2,020**	1,260*	1,950**	1,380*	-	-	-	-
В.В. Новожилов	2,020**	1,350*	1,950**	1,650*	2,560**	0,830*	2,520**	0,900*
В.П. Когаев	2,200*	-	-	-	2,740*	-	-	-
Наши данные по определению оптимального размера ячейки	2,020**	0,5*	1,950**	0,7*	2,560**	0,3*	2,520**	0,3*
Наш расчет при экстраполяции и размера ячейки в ноль	2,110*	-	2,200*	-	2,640*	-	2,760*	-

Примечание:

1. Звездочками отмечены величины, которые определялись расчетным путем в соответствии с рекомендациями различных авторов.

2. Двумя звездочками отмечены наши экспериментальные значения эффективного коэффициента концентрации напряжений.

References:

- Pawlov PA (1983) Ein Energiomodell der hochzyklischen Ermüdung und seine praktische Anwendung. Technische Mechanik, 4, 1983, Heft 1.
- Pavlov PA, Malibekov AK (1986) Mnogociklovaja ustalost' uglerodistyh stalej pri ploskom naprjazhennom sostojanii. Soobshhenie 1 i 2. Problemy prochnosti, 1986, №6, p.55-60, №8, p.41-45.
- Vejbull V (1964) Ustalostnye ispytaniya i analiz ih rezul'tatov. – M.: Mashinostroenie, 1964.
- Pavlov PA, Dzhakijaev DK (1985) Prognozirovanie mnogociklovyh ustalostnyh povrezhdenij stali pri slozhnom neodnorodnom



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHII (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

- naprjazhennom sostojanii. //10
Vsesojuzn.nauchno-tehn. konf. po
konstrukcionnoj prochnosti dvigatelej: Tez.
dok.- Kujbyшев, 1985.
5. Dzhakijaev DK, Malibekov AK, Kasymov UT (1998) Prognozirovanie dolgovechnosti konstrukcionnyh jelementov pri mnogokomponentnom nestacionarnom ciklicheskom nagruženii. Nauka i obrazovanie Juzhnogo Kazahstana. 1998.№ 4.
 6. Dzhakijaev DK, Malibekov AK, Egemkulov GT (2002) Jeksperimental'no teoreticheskaja ocenka ustalostnoj prochnosti konstrukcionnyh jelementov pri nestacionarnyh silovyh vozdeystvijah. Nauka i obrazovanie Juzhnogo Kazahstana, 2002, №30.
 7. Dzhakijaev DK, Kasymov UT (2005) Jeksperimental'no-teoreticheskaja ocenka soprotivlenija ustalosti stal'nyh konstrukcionnyh jelementov pri slozhnom neodnorodnom naprjazhennom sostojanii.// Aktual'nye problemy mehaniki i mashinostroenija: Trudy mezhdunar. nauchnoj konf. -Almaty, 2005.
 8. Malibekov AK, Dzhakijaev DK (2008) O metodike rascheta dolgovechnosti na osnovy jenergeticheskoy modeli mnogociklovyh ustalosnyh povrezhdenij //Mehanika i modelirovanie processov tehnologii -2008, №2
 9. Dzhakijaev DK (2011) O ocenke dolgovechnosti stal'nyh konstrukcionnyh jelementov v uslovijah ciklicheskogo nagruženija// Mehanika i modelirovanie processov tehnologii – 2011, №2
 10. Dzhakijaev DK, Nusipali RK (2015) Ocenka ciklicheskoj prochnosti po jenergeticheskoy modeli razrushenija materiala Teoreticheskaya i prikladnaya nauka. Theoretical & Applied Science. Materials jf the International Scientific Practikal Conference: Industry & Technology Europe, France, Lyon, 30.05.2015
 11. Dzhakijaev DK (2012) Mnogociklovaja ustalost' stal'nyh konstrukcionnyh jelementov pri slozhnosti neodnorodnom naprjazhennom sostojanii v uslovijah stacionarnogo simmitrichnogo cikla nagruženija. Materialy mezhdunar. nauchno-prakt. konf «VII Dulatovskie chtenija», Taraz, 2012.
 12. Dzhakijaev DK (2012) Jeksperimental'no-teoreticheskaja ocenka mnogociklovoj ustalosti stal'nyh konstrukcionnyh jelementov pri slozhnom neodnorodnom naprjazhennom sostojaniem v uslovijah stacionarnogo nesimmetricheskogo cikla nagruženija. Materialy mezhdunar.nauchno-prak.konf «Urkumbaevskie chtenija» Vodnye resursy i puti ih racional'nogo ispol'zovanija v sovremennyh uslovijah, Taraz, 2012.



Impact Factor:

ISRA (India) = 1.344
ISI (Dubai, UAE) = 0.829
GIF (Australia) = 0.564
JIF = 1.500

SIS (USA) = 0.912
PIHHI (Russia) = 0.234
ESJI (KZ) = 3.860
SJIF (Morocco) = 2.031

ICV (Poland) = 6.630
PIF (India) = 1.940
IBI (India) = 4.260

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 10.04.2017 <http://T-Science.org>

Denis Chemezov

Master of Engineering and Technology,
Corresponding Member of International Academy of
Theoretical and Applied Sciences, Lecturer of Vladimir
Industrial College, Russian Federation
chemezov-da@yandex.ru



Elena Kiseleva

Master of Industrial Training,
Vladimir Industrial College,
Russian Federation

SECTION 6. Metallurgy and energy.

ENERGY AUDIT SYSTEM AT THE JSC «ZAVOD AVTOPRIBOR» (VLADIMIR, RUSSIA)

Abstract: The article considers the system of events aimed at the energy audit of the structural units of the JSC «Zavod Avtopribor». The choice of the most rational lighting one of the energy-intensive production premises of the enterprise was performed on the basis of the computer calculation.

Key words: an enterprise, lighting, energy resources.

Language: English

Citation: Chemezov D, Kiseleva E (2017) ENERGY AUDIT SYSTEM AT THE JSC ZAVOD AVTOPRIBOR.VLADIMIR, RUSSIA. ISJ Theoretical & Applied Science, 04 (48): 15-18.

Soi: <http://s-o-i.org/1.1/TAS-04-48-3> **Doi:** <https://dx.doi.org/10.15863/TAS.2017.04.48.3>

Introduction

Energy audit [1] at the enterprises is performed with the aim of the determination of use the energy resources for the subsequent reliability improvement of energy supply.

Vladimir «Zavod «Avtopribor» [2] is currently the largest technology complex, which is specialized on the production of the components for car assembly enterprises of Russia, CIS and other countries. The JSC «Zavod «Avtopribor», with a total area of 140000 m², locates on two sites. At the enterprise there are more than 1000 units of the technological equipment, including automated. The equipment placed on the ten industries of the plant. The internal infrastructure consists of the energy supply system, steam supply, water supply, gas supply and water treatment.

The exploitation of the obsolete technological equipment and faults in auxiliary systems can cause irrational use of the energy resources. To eliminate of the energy losses it is necessary regular to conduct energy audits.

Materials and methods

Energy saving at the enterprise is achieved by the following complex of events:

1. Reduction of the losses in all energy types of the production.
2. Decrease of the share of energy costs in the cost structure of the enterprise production.
3. Improving of the competitiveness of the automotive components in the international market.

Methods of the rational use of energy resources at the enterprise are presented in the table 1.

Table 1

Methods of the rational use of the energy resources at the enterprise.

Method name	Method description
«Count, save and pay»	Lean model of the energy resources consumption
«New light»	Gradual replacement of the inefficient light sources to energy-efficient lighting devices
«Small complete energetics»	The implementation of the equipment for the local energetics

Also in the framework of the rational use of the energy resources it was carried out compliance with the current regulatory framework in the field of energy saving, improving of the efficiency of energy use and continuous advanced training of the

personnel associated with the organization of energy saving.

By the main components of fuel and energy resources (FER), in percentage terms, are: electrical energy – 50...60 %, steam – 23...30 %, heating –

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

10...15 %, technical water – 6...8 %, city water – 4...6.5 % and gas – 0.5 %.

The ratio of the approved budget costs of the FER to the actual costs at the JSC «Zavod

«Avtopribor» for 5 months of the year is presented in Fig. 1.

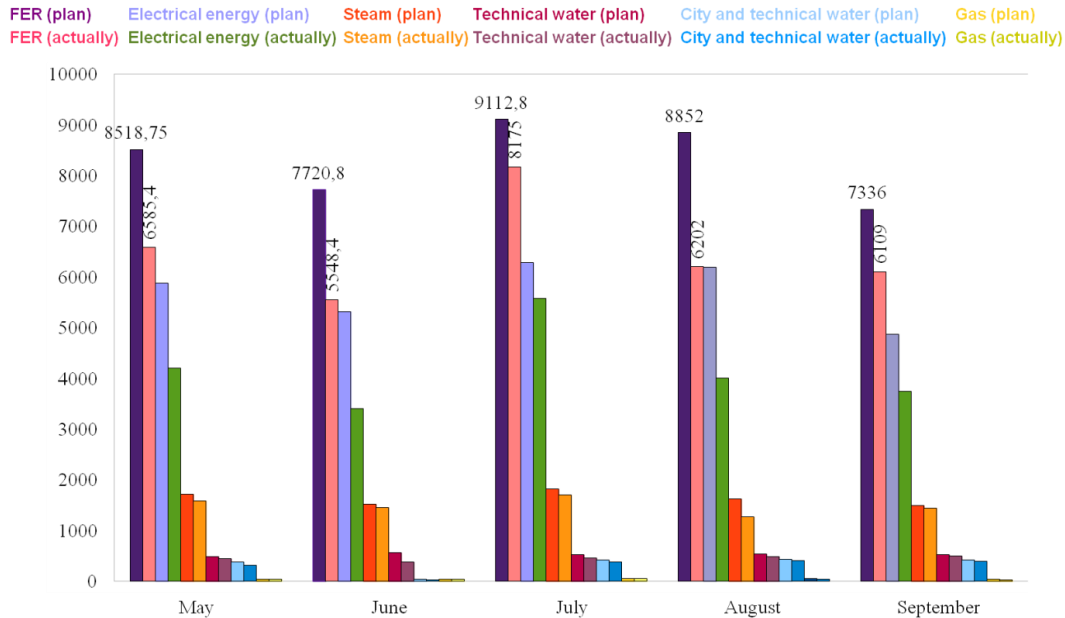


Figure 1 – The ratio of the approved budget costs of the FER to the actual costs.

The procedure of organization and conducting of the energy audit at the enterprise is set by the working instruction of the quality system (WIQS – SGE 17.0-2012) [3]. This manual applies to all structural units, including at the third-party organizations located at the enterprise.

The system of organization and conducting of the energy audit at the enterprise consists of a number of the optimizing actions: the policy of «Energy saving» → planning → arrangement → energy audits → analysis by the management of the

enterprise → implementation of the energy saving events → reduction of losses in the energy sector → continuous improvement.

On the basis of developed and approved schedules from May to September, it was made 30 energy audits in the energy-intensive structural units of the enterprise. All information about the violations of the energy use was entered in the summary list. Table 2 presents the revealed violations per working day on the first floor of the industrial building №2, the site «A».

Table 2

The violations of the energy use in the production unit of the enterprise.

Description of violation	Corrective actions	Losses
Working lighting line from 7 to 10 a.m.	To restore the lighting, to provide the instruction	Electrical energy 0.69 kW
7 locations of the steam leaks was revealed on the steam line near the site of the chemical passivation	To prepare the interplant ordering by the elimination of the violations	Steam 7 holes × 24 hours
Around the workshop there were not depressurized the exits of the air ducts through the walls to the outside	To prepare the interplant ordering on the sealing of the passages in the filler structures	Heat losses through the walls are 20 – 30% of the total volume
On the main steam line there was depressurized the valve	To prepare the works on the elimination of the violation	Steam 10 holes × 100.5 hours
The gate with the inscription «Chemical storage» is opened, operators warmed at the expense of the open drying cabinets	To set heat gun	Heat losses through the walls are 20 – 30% of the total volume

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHIJ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

The violations were analyzed and implemented the corrective actions. One of the actions it was the reconstruction of lighting in the industrial building №1 on the site «A» by implementing of the energy-efficient lamps. The calculation of the rational illumination of the industrial premise was made by the computer program DIALux [4].

In the program it was set the metric system of calculation of the coordinates and dimensions. The information about the lamps is loaded from the special computer directories. The premise has the following dimensions: length – 102 m, width – 30 m and mounting height – 6.2 m. The workplane, on which was carried out by the calculation, was taken at a height of 0.85 m from the floor level of the premise. The calculation was carried out for the total volume of the premise, which is the boundary zone (the distance from the walls), was taken by zero. The maintenance factor [5] was adopted the value of 0.8.

The premise plan was displayed at a scale of 1:730. The reflection coefficient [6] for the floor was set 20 %, for the ceiling – 70 %, for the six walls – 50 %.

Two options of illuminance of the industrial premise by the lamps were considered:

1. PROTON SSO-220/64-05.XWE. It is led pendant lamp. The lamp has a cosine curve of luminous intensity (CIL) [7] and can be used for the lighting of the office and the industrial facilities with a correction factor of 1.0 [8]. It is necessary 136 pieces with a power of 72 W and the intensity of the light flux of 6720 lumens.

2. Energy saving lamp TSU LSP-01-2×58-S with a correction factor of 1.0. It is necessary 84 pieces with a power of 110 W and the intensity of the light flux of 10400 lumens.

The results of the calculations are presented in Fig. 2.

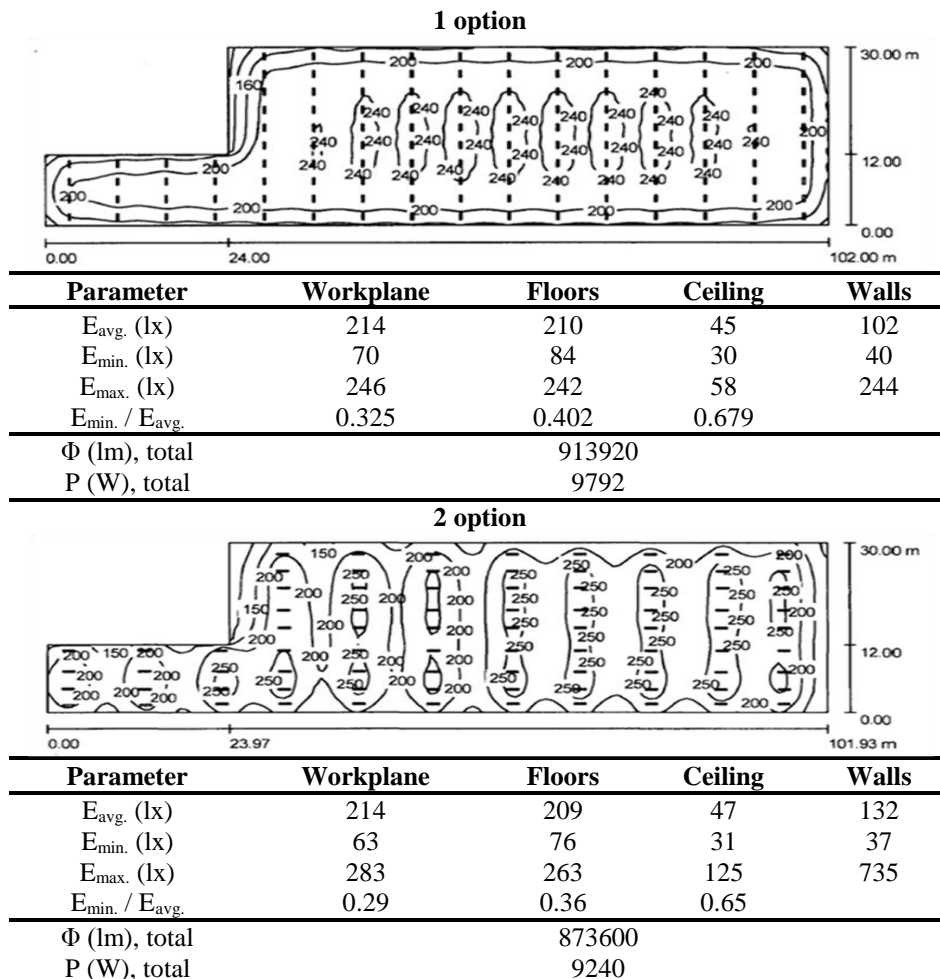


Figure 2 – The results of the lighting calculations of the production premise.

In the figure indicated:

$E_{avg.}$ – average illuminance;

$E_{min.}$ – minimum illuminance;

$E_{max.}$ – maximum illuminance;

$E_{min.} / E_{avg.}$ – uniformity of the illuminance distribution;

Φ – intensity of the luminous flux;

P – power.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

Specific connected load for the first option is 3.73 W/m², for the second option is 3.52 W/m². Ground area – 2628 m².

By the lower expended total power and the highest maximum illuminance the second option of the calculation is preferred.

Conclusion

The optimization of the energy consumption of the enterprise is realized by the with complex calculation and the further analysis of the energy-intensive productions in the structural units. Monitoring of use the FER during the prescribed plan shows an effective implementation of the audit system in the enterprise.

References:

1. (2017) Energy audit. Available: https://en.wikipedia.org/wiki/Energy_audit (Accessed: 02.04.2017).
2. (2017) Avtopribor. Available: <http://avtopribor.ru> (Accessed: 02.04.2017).
3. (2017) Uninterruptible power systems. Available: <http://www.remstroy.com/default.aspx?did=12> (Accessed: 02.04.2017).
4. (2017) DIAL light building software. Available: <https://www.dial.de/en/home/> (Accessed: 02.04.2017).
5. (2017) Maintenance factors. Available: http://en.wiki.dialux.com/index.php/Maintenance_factors (Accessed: 02.04.2017).
6. (2017) Reflection coefficient. Available: http://remartspb.ru/infopages/kojefficient_otrazhenija.php (Accessed: 02.04.2017).
7. (2017) Light intensity curve. Available: <http://www.astarta-led.ru/kss/> (Accessed: 02.04.2017).
8. (2017) Correction factor. Available: <http://elektrika-svoimi-rykami.com/raschet-osveshheniya/raschet-osveshheniya> (Accessed: 02.04.2017).

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	ПИИИ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 10.04.2017 <http://T-Science.org>

Mahruy Saidalievna
Dr, Head of dept. "Regulatorika"
Centre for the development of software and
hardware program complexes at Tashkent University of
Informational Technologies, Tashkent, Uzbekistan
regulatorika@yahoo.com

Mohiniso Bahromovna Hidirova
PhD, Senior Scientist, dept. "Regulatorika"
Centre for the development of software and
hardware program complexes at Tashkent University of
Informational Technologies, Tashkent, Uzbekistan
regulatorika@yahoo.com

SECTION 2. Applied mathematics. Mathematical modeling.

MATHEMATICAL MODELING REGULATORY MECHANISMS OF HEPATITIS B VIRUSES'S MICRO-RNA ACTION

Abstract: This paper considers the method for modeling regulatorika of the interconnected activity between molecular-genetic systems of hepatocytes and hepatitis B viruses (HBV). During computing experiments with the developed program complex it is established that there are the following regimes of the process, which depend on HBV miRNA concentration: clarification, symbiosis, regular and irregular fluctuations, sharp destructive changes which define various clinical forms of disease.

Key words: modeling, regulatorika, functional-differential equations with delay, miRNA, viral hepatitis, functional equation.

Language: Russian

Citation: Saidalievna M, Hidirova MB (2017) MATHEMATICAL MODELING REGULATORY MECHANISMS OF HEPATITIS B VIRUSES'S MICRO-RNA ACTION. ISJ Theoretical & Applied Science, 04 (48): 19-23.

Soi: <http://s-o-i.org/1.1/TAS-04-48-4> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.4>

УДК 576.35:517.948

МАТЕМАТИЧЕСКОЕ МОДЕЛИРОВАНИЕ РЕГУЛЯТОРИКИ МИКРО-РНК ВИРУСОВ ГЕПАТИТА В

Аннотация: В статье рассматривается метод моделирования регуляторики взаимосвязанной деятельности молекулярно-генетических систем гепатоцитов и вирусов гепатита В. Выявлены, в ходе вычислительных экспериментов с разработанным программным комплексом на основе предложенных уравнений, следующие режимы рассматриваемого процесса, которые зависят от концентрации микроРНК вирусов гепатита В: очищение, симбиоз, регулярные и нерегулярные колебания, резкие деструктивные изменения.

Ключевые слова: моделирование, регуляторика, функционально-дифференциальные уравнения с запаздыванием, микроРНК, вирусные гепатиты, функциональные уравнения.

Введение

Инфицирование вирусами гепатита В (HBV) остается глобальной проблемой здравоохранения. Иногда следствием хронической HBV-инфекции бывает первичноклеточный рак печени. HBV модифицирует клеточный эпигеном. Геном вирусов гепатита В кодирует микроРНК (miRNA). В последние годы наблюдается бурный рост работ по генной регуляции, связанный с открытием в геноме человека генов, кодирующих регуляторные молекулы – микроРНК, которые негативно регулируют экспрессию многих генов [1-11]. МикроРНК

синтезируются из более длинных предшественников и не кодирует белки [1-2]. В большинстве случаев miRNA действуют как репрессоры трансляции за счет связывания с и-РНК. МикроРНК вирусов гепатита В не транслируют белки, но являются регуляторами синтеза белка. Одна и та же микроРНК вирусной генетической системы нелинейным, сложным образом регулирует трансляцию многих и-РНК генетической системы гепатоцита (рисунок 1). МикроРНК приводят к разрушению и-РНК или подавлению трансляции с целевой и-РНК. При этом они способны подавлять трансляцию

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	ПИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

посредством различных механизмов: как на этапе инициации, так и в процессе элонгации. Механизм прекращения трансляции также зависит от степени комплементарности связывающихся областей микроРНК и и-РНК. Дегградация и-РНК включает такие процессы, как деаденилирование, декапирование и экзонуклеарное расщепление молекулы и-РНК. Однако, до конца механизм действия микроРНК еще не изучен. Раскрытие регуляторных механизмов действия микроРНК существенно поможет определению механизмов

формирования и развития инфекционного процесса при вирусном гепатите В на молекулярно-генетическом уровне и позволит найти эффективные пути целенаправленного лечебного и профилактического воздействия на молекулярно-генетическую систему гепатоцита. Обзор работ показывает, что на сегодняшний день отсутствуют работы по математическому моделированию регуляторных механизмов действия микроРНК с учетом временных взаимоотношений, кооперативных процессов и комбинированных обратных связей.

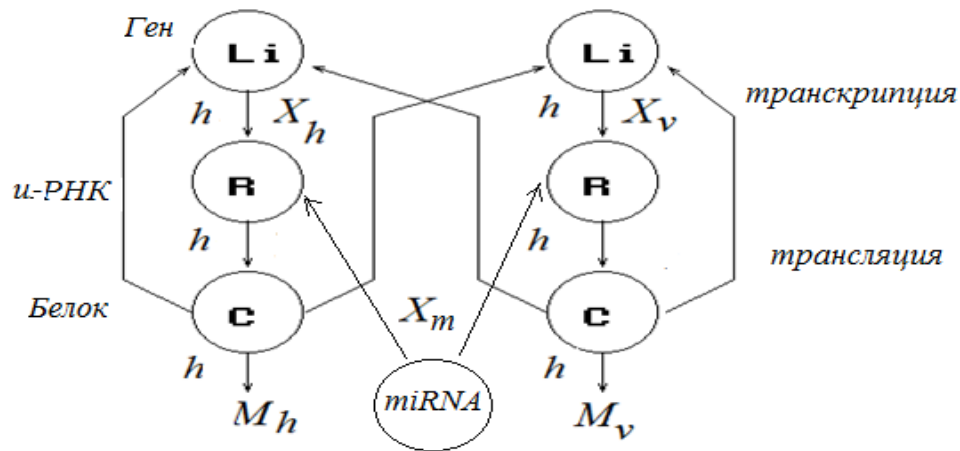


Рисунок 1 – Схема взаимосвязанной деятельности молекулярно-генетических систем гепатоцитов и вирусов гепатита В с учетом действия микроРНК.

Материалы и методы

Вирусные микроРНК могут участвовать в подавлении экспрессии собственных вирусных генов. Активность молекулярно-генетической системы вирусов гепатита В зависит от уровня функционирования таковой гепатоцита. С учетом этих факторов регуляторика взаимосвязанной деятельности молекулярно-генетических систем гепатоцита и вирусов гепатита В может быть количественно описана следующей системой функционально-дифференциальных уравнений, построенной с использованием метода математического моделирования регуляторики живых систем [12]

$$\frac{dX_h(t)}{dt} = \gamma_h X_h(t-h) e^{-\delta_h M_h(t-h) - m X_m(t-h)} - b_h X_h(t);$$

$$\frac{dX_v(t)}{dt} = \gamma_v X_h(t-h) X_v(t-h) e^{-\delta_h M_h(t-h) - \delta_v M_v(t-h)} - b_v X_v(t);$$

$$\frac{dX_m(t)}{dt} = \gamma_v X_h(t-h) X_v(t-h) X_m(t-h) e^{-m X_m(t-h)} - b_m X_m(t);$$

$$\frac{dM_h(t)}{dt} = \mu_h X_h(t-h) - c_h M_h(t);$$

$$\frac{dM_v(t)}{dt} = \mu_v X_v(t-h) - c_v M_v(t);$$

$$X_m(t) = \varphi_m(t); \quad X_h(t) = \varphi_h(t); \quad X_v(t) = \varphi_v(t);$$

$$M_h(t) = \eta_h(t); \quad M_v(t) = \eta_v(t)$$

$$\text{при } t_0 - h \leq t \leq t_0 \quad (t_0 > h),$$

где $\varphi_m(t)$, $\varphi_h(t)$, $\varphi_v(t)$, $\eta_h(t)$, $\eta_v(t)$ – непрерывные функции на $[t_0 - h, t_0]$; t_0 – начало модельных исследований (при аналитических исследованиях, в случае необходимости, можно принять $t_0 = 0$); $X_h(t)$ выражает концентрацию и-РНК генетической системы гепатоцита; $X_v(t)$

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	РИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

выражает уровень активности системы транскрипции генетической системы вируса гепатита; $X_m(t)$ выражает концентрацию микроРНК генетической системы вирусов гепатита В; $M_h(t)$, $M_v(t)$ – уровни активностей систем трансляции гепатоцита и вирусов гепатита В (концентрации белковых продуктов). Все параметры неотрицательны. В первых трех уравнениях системы (1) учитывается репрессорное влияние молекулярно-генетической системы вирусов гепатита В на функционирование гепатоцитов. Из системы уравнений (1) видно, что генетическая система гепатоцита может функционировать самостоятельно и отсутствие вирусов гепатита В ($M_h(t) = 0$) освобождает его от репрессивного экспоненциального члена в правой части первого уравнения. В отличие от этого, генетическая система вирусов гепатита В не может функционировать самостоятельно и «погибает» если молекулярно-генетическая система гепатоцита перестает функционировать ($M_h(t) = 0$). Учитывая, что вирусы гепатита В своими микроРНК воздействует на клетку печени, подавляя её, и затем беспрепятственно размножается, в качестве уравнений минимальной математической модели регуляторики молекулярно-генетической системы гепатоцита и вирусной микроРНК можно принять уравнения

$$\begin{aligned} \delta_1 \frac{dX(t)}{dt} &= aX(t-1)e^{-\omega(t)} - X(t); \\ \delta_2 \frac{dY(t)}{dt} &= bX(t-1)Y(t-1)e^{-\omega(t)} - Y(t); \\ \delta_3 \frac{dZ(t)}{dt} &= cX(t-1)Y(t-1)Z(t-1)e^{-\omega(t)} - Z(t), \end{aligned} \quad (2)$$

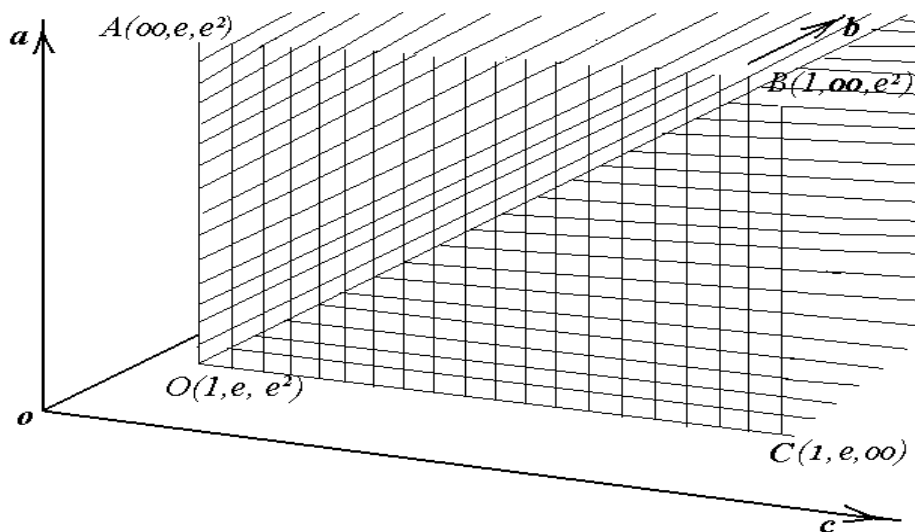


Рисунок 2 – Область изменения значений параметров уравнений (2) при критической концентрации микро-РНК.

$$\omega(t) = X(t-1) + Y(t-1) + Z(t-1),$$

где $X(t)$, $Y(t)$, $Z(t)$ – величины, характеризующие количество продуктов соответствующих генетических систем гепатоцита, вирусов гепатита В и концентрации микро-РНК вирусов гепатита В в момент времени t ; δ_1 , δ_2 , δ_3 – параметры регуляторики системы; a , b , c – параметры, характеризующие уровни активностей молекулярно-генетических систем гепатоцита, вирусов гепатита В и микро-РНК вирусов гепатита В; все параметры неотрицательны.

Качественное исследование функционально-дифференциальных уравнений регуляторики системы «гепатоцит–вирусы гепатита В» [12] привело к следующим условиям критического уровня концентрации микро-РНК (рисунок 2)

$$a > 1, \quad b > e, \quad c > e^2.$$

Это приводит к следующим координатам нетривиального положения равновесия

$$\begin{aligned} \xi &= 1; \quad \eta = \frac{a}{c}; \\ \mu &= \ln a - 1 - \frac{a}{c}. \end{aligned}$$

Определение области изменения значений параметров из условия положительности данных координат (условие заражения) приводит к $a > e$ и соотношению $c = a / (\ln a - 1)$.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	ПИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

Результаты качественного анализа показывают, что наличие в гепатоците инфекционного процесса гепатита В приводит к резкому увеличению активности молекулярно-генетической системы гепатоцита. Результаты фрактального анализа с использованием значений энтропии Колмогорова (вычисления проводились на РС для отдельных уравнений (2) с дискретной модельной системой) показали возможность сложных колебаний при определенных значениях параметров. Исследование решений дискретных

модельных уравнений системы (2), проведенное на РС с помощью построения диаграмм Ламерея (рисунки 3 и 4), вычисления ляпуновской величины, хаусдорфовой и высших размерностей, позволяет выявлять динамические характеристики поведения решений рассматриваемого уравнения, определять значения параметров наступления конкретных режимов и приближение границ областей однородных режимов поведения.

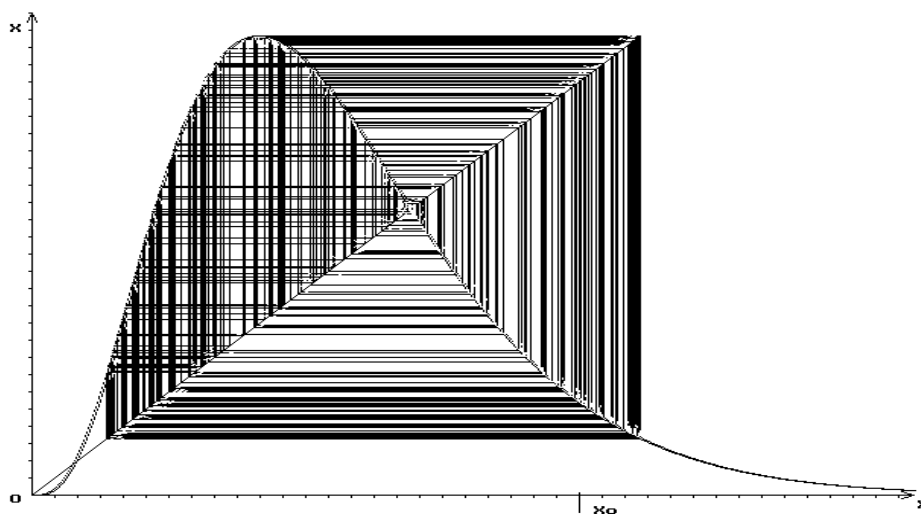


Рисунок 3 – Диаграмма Ламерея модельной системы (2) в области хаоса.

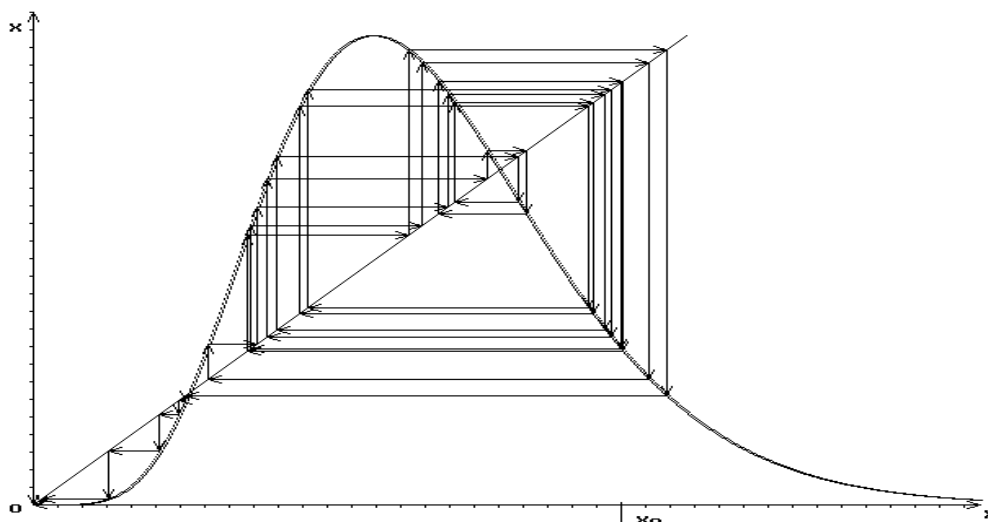


Рисунок 4 – Диаграмма Ламерея модельной системы (2), попавшей в сферу притяжения «черной дыры».

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	РИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

Заключение

Таким образом, результаты проведенных исследований математической модели регуляторики транскрипции и трансляции в молекулярно-генетической системе гепатоцита и вирусов гепатита В на основе бифуркационного и фрактального анализов, построения их фазовых и параметрических портретов показывают возможность сложного поведения взаимосвязанной молекулярно-генетической системы гепатоцита и вирусов гепатита В, включая механизмы взаимного подавления их активности и симбиотического функционирования.

Выявлены, в ходе вычислительных экспериментов с разработанным программным комплексом, следующие режимы рассматриваемого процесса (которые зависят от концентрации микроРНК вирусов гепатита В): очищение, симбиоз, регулярные и нерегулярные колебания, резкие деструктивные изменения,

которые определяют различные клинические формы заболевания вирусным гепатитом В.

Общий анализ уравнений (1), (2) и серия вычислительных экспериментов позволили выяснить, что непосредственное влияние функционирования молекулярно-генетической системы вирусов гепатита В на гепатоцит осуществляется на основе **механизма ингибирования**. Подавление функционирования молекулярно-генетической системы гепатоцита прямо пропорционально уровню активности молекулярно-генетической системы вирусов гепатита В (в частности, уровню концентрации микроРНК). Причем подавление носит экспоненциальный характер. Это означает, что усиление подавления происходит не в линейном и не в кратном, а в степенном порядке. Видимо, этим механизмом определяется часто наблюдаемое превосходство молекулярно-генетической системы вирусов при взаимном функционировании.

References:

1. Yates LA, Norbury CJ, Gilbert RJ (2013) The long and short of microRNA. *Cell* 2013;153: 516-519.
2. Pan F, Mao H, Deng L (2014) Prognostic and clinicopathological significance of microRNA-21 overexpression in breast cancer: a meta-analysis. *Int J Clin Exp Pathol* 2014; 15; 7 (9): 5622-5633
3. Hwang HW, Mendell JT (2007) MicroRNAs in cell proliferation, cell death, and tumorigenesis. *Br J Cancer* 2007;96:R40-44.
4. Zhenqiang W, Qiang C, Zhaoyan J (2014) Prognostic Role of MicroRNA-21 in Gastric Cancer: a Meta-Analysis. *Med Sci Monit* 2014; 18 (20): 1668-1674.
5. Li C, Gao Y, Zhang K, Chen J, Han S, Feng B, Wang R, Chen L (2015) Multiple Roles of MicroRNA-100 in Human Cancer and its Therapeutic Potential. *Cell Physiol Biochem* 2015;37: 2143-2159.
6. Su S, Cao W, Liu W, Lu Z, Zhu D, Chao J, Weng L, Wang L, Fan C, Wang L (2017) Dual-mode electrochemical analysis of microRNA-21 using gold nanoparticle-decorated MoS(2) nanosheet. *Biosens Bioelectron.* 2017, pp. 552-559.
7. Zhao C, Ma ZG, Mou SL, Yang YX, Zhang YH, Yao WC (2017) Targeting effect of microRNA on CD133 and its impact analysis on proliferation and invasion of glioma cells. *Genet Mol Res.* 2017, 16(1).
8. Gao Y, Feng B, Han S, Lu L, Chen Y, Chu X, Wang R, Chen L (2016) MicroRNA-129 in Human Cancers: from Tumorigenesis to Clinical Treatment. *Cell Physiol Biochem* 2016; 39: 2186-2202.
9. Gao Y, Feng B, Han S, Zhang K, Chen J, Li C, Wang R, Chen L (2016) The Roles of MicroRNA-141 in Human Cancers: From Diagnosis to Treatment. *Cell Physiol Biochem* 2016; 38: 427-448.
10. Farazi TA, Hoell JI, Morozov P, Tuschl T (2016) MicroRNAs in human cancer. *Adv Exp Med Biol* 2013;774: 1-20.
11. Xu R, Liu S, Chen H, Lao L (2016) MicroRNA-30a downregulation contributes to chemoresistance of osteosarcoma cells through activating Beclin-1-mediated autophagy. *Oncol Rep* 2016;35: 1757-1763.
12. Hidirov BN (2014) Selected works on mathematical modeling living systems regulatorika. Moscow-Ijevsk, 2014, 304 P. (in Russian).



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 10.04.2017 <http://T-Science.org>

Waldemar Nowakowski

PhD, assistant professor

Kazimierz Pulaski University of Technology and

Humanities in Radom,

Faculty of Transport and Electrical

w.nowakowski@uthrad.pl

SECTION 4. Computer science, computer engineering and automation.

NETWORK MANAGEMENT SOFTWARE FOR REDUNDANT ETHERNET RING

Abstract: It is hard to imagine a contemporary world without tools helping in fast and efficient communication. A fundament of the modern communication is created by network infrastructure. Safety and reliability constitute main requirements for the network infrastructure, especially in the industry usage. Network technologies are helpful in achieving this condition. The author of this publication described the redundant Ethernet ring and proposed a method of the ring status control with the use of SNMP (Simple Network Management Protocol). Next, taking this method into account, the author developed network management software. In this article, the functionality of this software, with attention paid at diagnostics of the status ring, has been described. Verification of a practical method of the ring status control has proven its usefulness. It allows creating diagnostic software compatible with managed devices developed by various producers.

Key words: Network Management Software, Redundant Ethernet Ring, Reliability, Fault localization.

Language: English

Citation: Nowakowski W (2017) NETWORK MANAGEMENT SOFTWARE FOR REDUNDANT ETHERNET RING. ISJ Theoretical & Applied Science, 04 (48): 24-29.

Soi: <http://s-o-i.org/1.1/TAS-04-48-5> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.5>

Introduction

Ethernet network is a worldwide standard of computer networks. The Ethernet standard describes a method of connecting computers and using common cables for data transmission. Ethernet concerns data transmission on the physical layer. Network topology determines the method of mutual connection of the network hosts [15]. The most popular topology where it comes to the Ethernet standard is the star topology. In this topology, network hosts are connected to one network device, e.g. a switch [1]. An inconvenience of this solution is the faultiness of the network segment in case of a damage of a device, which is its central point [8]. A least-cost solution of this problem is using the redundant Ethernet ring topology, in which the network hosts are connected in a way so that they create a ring. At first, Ethernet did not allow to build ring topology networks. Only when the STP (Spanning Tree Protocol) (IEEE 802.1d) was developed, has it allowed to use the ring topology in Ethernet networks. On the basis of this protocol, new protocols were created, including e.g. RSTP (Rapid Spanning Tree Protocol) (IEEE 802.1w), MSTP (Multiple Spanning Tree Protocol) (IEEE 802.1s) and SPB (Shortest Path Bridging) (IEEE 802.1aq).

Additionally, network devices' producers propose their own, authorial solutions, such as Turbo Ring, Hiper Ring, Super Ring, and the like. Regardless of this, there is a problem of remote diagnostics and monitoring the network working in the redundant ring topology.

Because of the requirement of high reliability, this problem concerns mostly using the ring technology in industry. That is why manufacturers of industrial switches propose their own technological solutions and software, e.g. MXview by MOXA, Korenix NMS or HiVision made by Hirschmann. A disadvantage of these solutions is that they are designed and optimized for their own products [5]. The author of this publication has developed a universal NMS (Network Management Software), which provides the control over the redundancy Ethernet ring only thanks to the SNMP protocol.

Simple Network Management Protocol

Simple Network Management Protocol (SNMP) is a protocol for collecting and modifying information about managed network devices [10, 12]. Currently SNMP is a standard used by most manufacturers of network equipment [6]. Within this protocol there are two types of equipment: managers and agents. A computer plays a role of SNMP



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

manager when it runs a special program called Network Management Software (NMS) [2, 4]. A device is being managed when it runs SNMP agent. Management takes place when the NMS reads (or modifies) specific parameters, concerning the status of the device, which are stored by the SNMP agent. What is more, the agent can notify the manager about an unexpected event by sending a special message called SNMP trap, which includes information about the event. Information regarding the status of the device is being stored and shared by the agent, with the use of MIB (Management Information Base) [8, 16]. Objects are organized in a MIB base in hierarchies (tree structure). Names can be descriptive or numerical. In order to gain access to an object representing a certain resource (manager data) one needs to present all names, separated by dots, from the root to the leaf. International Organization for Standardization (ISO) is responsible for assigning names and numbers to nodes, this assures a unified nomenclature of objects.

Network Management Software

The NMS (Network Management Software), using the SNMP protocol can manage network devices which are SNMP agents [13, 14]. Thanks to the active network monitoring, it allows a quick failure diagnosis, which leads to the failure's shortening. The system is designed mostly for people

who want to automatize the process of failure diagnosis and remotely configure and control the status of network devices [3, 9, 11]. The NMS allows managing network by sharing a variety of functions:

- automatic networks scanning in the search of devices (SNMP agents),
- building a network map, which would be a visualization of the network topology (including the redundancy Ethernet ring topology),
- controlling devices' work, including collecting failure alerts (SNMP traps), controlling the redundancy ring status, also notifying the user about all abnormalities via email or SMS,
- visualization of the devices' failure and the ring status,
- allowing a remote configuration and control of the status of the devices by the user as a result of reading or change of chosen parameters (MIB objects) of the SNMP agents.

The first activity during parameterization of the NMS is a network scan in order to detect devices (SNMP agents). Scanning can take place in the broadcast mode or in a defined range of network addresses. As a result of the scanning, a list of available devices is created. The main screen of the NMS with an example list of four managed switches MOXA has been presented in the Figure 1.

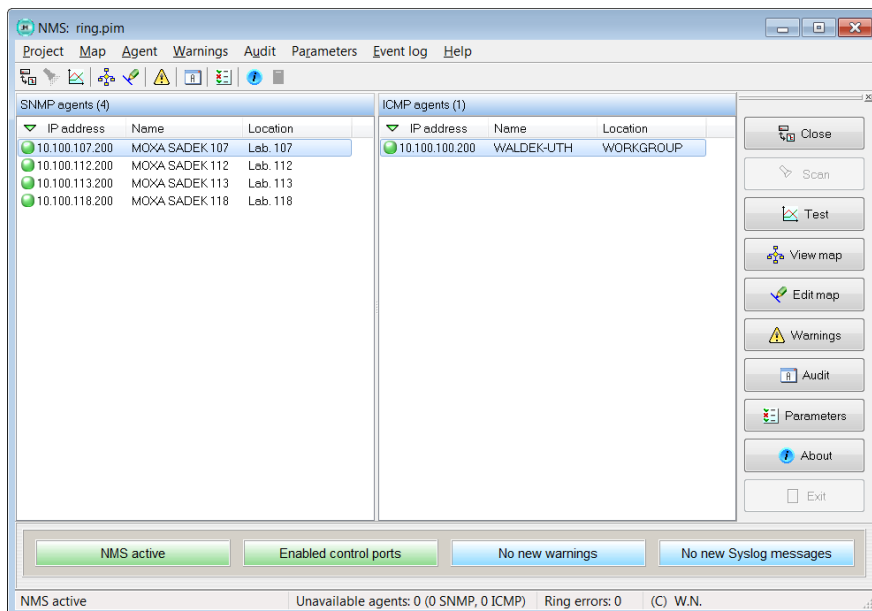


Figure 1 - The main screen of the NMS.

After performing the scanning, one can start building the network map. For each of the devices the user needs to point its type in order for the software to use the right graphic symbols. When the devices' symbols are put on the map, the user should link them, reproducing this way the network

topology. If the ring status is to be presented in the graphic form on the map, one should additionally define the numbers of the devices' ports when linking network's nodes. The network map editor with a visualization of the ring created from four MOXA switches has been presented in the Figure 2.

Impact Factor:

ISRA (India)	= 1.344	SIS (USA)	= 0.912	ICV (Poland)	= 6.630
ISI (Dubai, UAE)	= 0.829	PIHIQ (Russia)	= 0.234	PIF (India)	= 1.940
GIF (Australia)	= 0.564	ESJI (KZ)	= 3.860	IBI (India)	= 4.260
JIF	= 1.500	SJIF (Morocco)	= 2.031		

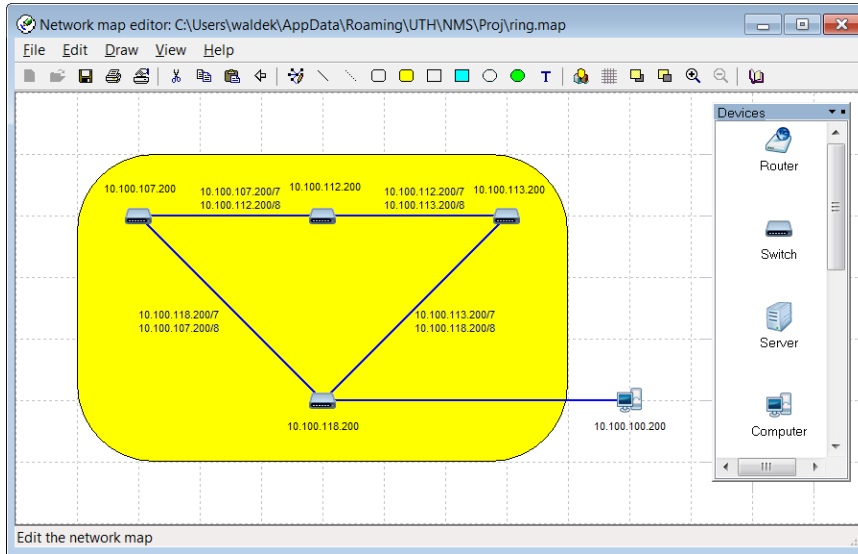


Figure 2 - Network map editor with ring visualization.

The NMS manages the work of network devices by conducting several automatic control actions. One of these activities is collecting alerts (SNMP traps) from agents and informing the user

about them (Figure 3). Alerts are archived in special files, which can later serve for finding the cause of the failure.

When	Who reported	Agent address	Type	Details
2017-03-09 13:17:52	Agent	10.100.118.200	linkDown	ifIndex=8
2017-03-09 13:17:52	Agent	10.100.118.200	enterpriseSpecific	1.3.6.1.4.1.8691.7.2.5=2
2017-03-09 13:17:52	Agent	10.100.107.200	linkDown	ifIndex=7
2017-03-09 13:17:52	Agent	10.100.107.200	enterpriseSpecific	1.0.8802.1.1.2.0.0.1-1 1.0.8802.1.1.2.1.2.2-3 1.0.8802.1.1.2.1.2.3-0 1.0.8802.1.1.2.1.2.4-0 1.0.8802.1.1.2.1.2.5-1
2017-03-09 13:17:53	Agent	10.100.118.200	enterpriseSpecific	1.0.8802.1.1.2.0.0.1-1 1.0.8802.1.1.2.1.2.2-6 1.0.8802.1.1.2.1.2.3-0 1.0.8802.1.1.2.1.2.4-0 1.0.8802.1.1.2.1.2.5-4

Figure 3 - A list of SNMP traps.

In order to allow the control of the redundancy ring status, the user has to additionally set in the

NMS the control of the “*ifOperStatus*” object of the MIB base for all ports creating the ring.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHIQ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

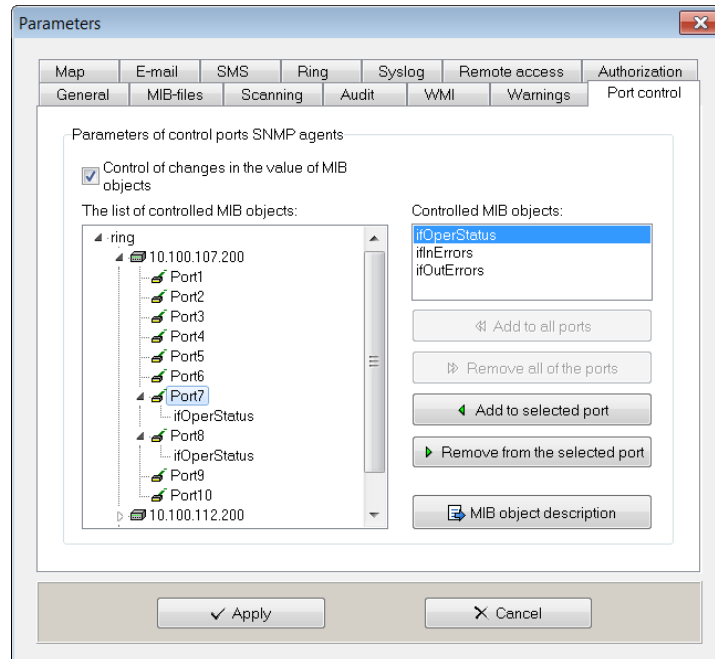


Figure 4 - Parametrization of the control of the SNMP agents' ports.

Information about a failure concerning a break in the ring is added to the failure list (Figure 3) and is visualized on the network map, which has been

presented in the Figure 5. Additionally, all information about failures can be passed on to the user via email or SMS.

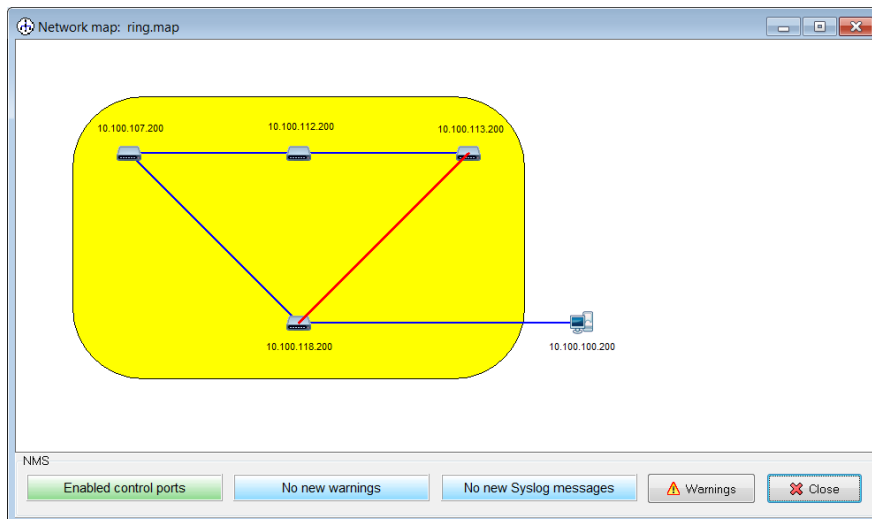


Figure 5 - An example visualization of the ring failure.

Apart from the number of automatically performed control actions, the NMS allows to control and configure devices manually. The user can look through the MIB tree, make queries about chosen

agents' parameters (MIB objects) or change their value (Figure 6 and Figure 7). The NMS has the MIB compiler built-in, which allows to attach private MIB files delivered by the equipment's manufacturers.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHIQ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

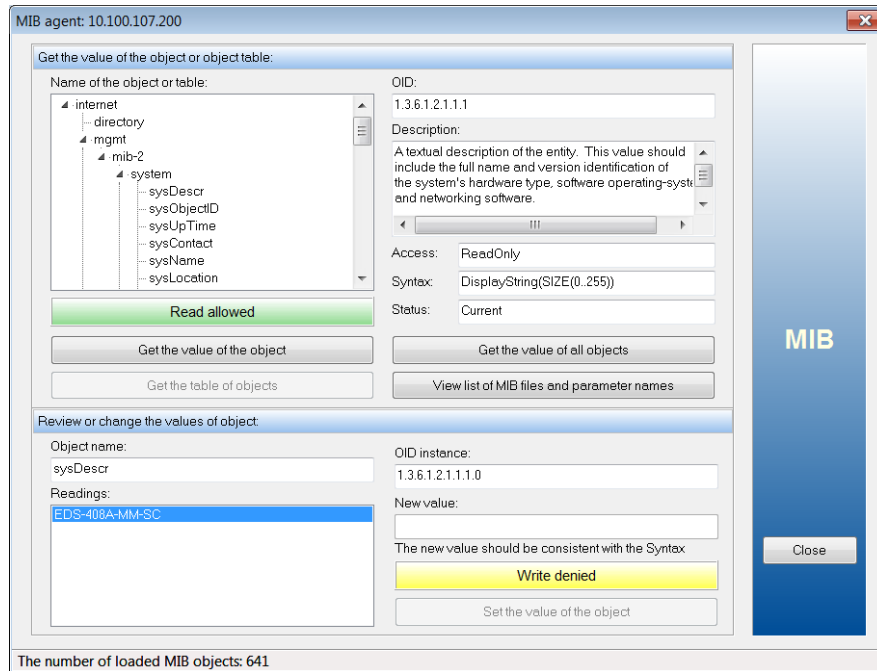


Figure 6 - SNMP MIB explorer.

ifIndex	ifDescr	ifType	ifMtu	ifSpeed	ifPhysAddress	ifAdminStatus	ifOperStatus	ifLastChange	ifInOctets
1	Ethernet Port 1	ether...	1632	10000000	00:00:00:00:00:00	Up (1)	Down (2)	00:00:00 (0)	0
2	Ethernet Port 2	ether...	1632	10000000	00:00:00:00:00:00	Up (1)	Down (2)	00:00:00 (0)	0
3	Ethernet Port 3	ether...	1632	10000000	00:00:00:00:00:00	Up (1)	Down (2)	00:00:00 (0)	0
4	Ethernet Port 4	ether...	1632	10000000	00:00:00:00:00:00	Up (1)	Down (2)	00:00:00 (0)	0
5	Ethernet Port 5	ether...	1632	10000000	00:00:00:00:00:00	Up (1)	Down (2)	00:00:00 (0)	0
6	Ethernet Port 6	ether...	1632	10000000	00:00:00:00:00:00	Up (1)	Down (2)	00:00:00 (0)	0
7	Ethernet Port 7	ether...	1632	10000000	00:00:00:00:00:00	Up (1)	Up (1)	29 days 19:...	34001985
8	Ethernet Port 8	ether...	1632	10000000	00:00:00:00:00:00	Up (1)	Up (1)	00:00:07 (778)	41314297
129	Management P...	ether...	1500	100000000	00:90:E8:4D:7E:9A	Up (1)	Up (1)	00:00:00 (0)	4959429
130	(Management ...	softw...	16384	0	00:00:00:00:00:00	Up (1)	Up (1)	00:00:00 (0)	0

Figure 7 - Example results of the control of the “ifTable” object.

Conclusion

For many years, Ethernet has been a popular and most widely deployed network technology in the world. Small costs and easiness of implementation of this technology contribute to the fact that it is used also in industry. Because of the requirements connected to the reliability of the industrial network, very often these networks are created in the redundant Ethernet ring topology. The author of this publication has presented his own software for the management and diagnostics of the Ethernet

network. In this software, among others, control of the ring status with the help of the SNMP protocol was taken into consideration. The software allows to visualize the ring status on the topology map and to notify the user about any abnormalities in the network’s functioning via email or SMS. Conducted tests have proven a significant usefulness of the SNMP standard in controlling the status of the network devices, including diagnosing the ring status, regardless of the type of devices used.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

References:

1. Claise B, Wolter R (2007) "Network Management: Accounting and Performance Strategies", Cisco Press, 2007
2. Duarte EP, dos Santos AL (2001) "Network fault management based on SNMP agent groups", 21st IEEE International Conference on Distributed Computing Systems, Phoenix, USA, 2001, Proceedings pp. 51-56
3. Kato N, Ohta K, Ika T, et al. (1999) "A proposal of event correlation for distributed network fault management and its evaluation", IEICE Transactions on Communications, Volume: E82B, Issue 6, pp. 859-867
4. Lu X (2009) "An Architecture for Web Based and Distributed Telecommunication Network Management System", 3rd International Symposium on Intelligent Information Technology Application, Nanchang, China, 2009, Proceedings, pp. 152-155, 2009
5. Łukasik Z, Nowakowski W (2015) „Sieciovie narzędzia diagnostyczne systemów sterowania ruchem kolejowym”, Technika Transportu Szynowego (TTS) 12/2015, str. 2715-2718
6. Mauro D, Schmidt K (2005) "Essential SNMP: Help for System and Network Administrators", O'Reilly Media
7. Nowakowski W, Siergiejczyk M (2007) „System monitorowania sieci teleinformatycznych”, Zeszyty Naukowe AMW, R. 48, nr 169K/1, str. 317-324, AMW Gdynia
8. Park SH, Park MS (2003) "An efficient transmission for large MIB tables in polling-based SNMP", 10th International Conference on Telecommunications (ICT 2003), Papeete, Polynesia, 2003, 10th International Conference on Telecommunications, Proceedings, pp. 246-252
9. Samba A (2006) "A network management framework for emerging telecommunications networks", Symposium on Modeling and Simulation Tools for Emerging Telecommunications Networks, Munich, Germany, 2005, Modeling and Simulation Tools for Emerging Telecommunication Networks: Needs, Trends, Challenges and Solutions, pp. 179-200
10. Saperia J (2002) "SNMP at the Edge: Building Effective Service Management Systems", McGraw-Hill Professional, 2002
11. Sathyan J, Shenoy K, Mohan A, et al. (2007) "Developing event driven intelligent network management systems", 11th World Multi-Conference on Systemics, Cybernetics and Informatics/13th International Conference on Information Systems Analysis and Synthesis, Orlando, USA, 2007, 11th World Multi-Conference on Systemics, Cybernetics and Informatics, Volume II, Proceedings, pp. 283-288
12. Stallings W (2013) "SNMP, SNMPv2, SNMPv3, and RMON 1 and 2", Addison Wesley Professional
13. Steinder M, Sethi AA (2004) "A survey of fault localization techniques in computer networks", Science of Computer Programming, Volume 53, Issue 2, pp. 165-194
14. Tang Y, Al-Shaer E, Boutaba R (2008) "Efficient fault diagnosis using incremental alarm correlation and active investigation for internet and overlay networks", IEEE Transactions on Network and Service Management, Volume: 5, Issue 1, pp. 36-49
15. Varga P, Moldovan I (2007) "Integration of service-level monitoring with fault management for end-to-end multi-provider ethernet services", Proceedings of the IEEE Transactions on Network and Service Management, Volume: 4, Issue 1, pp. 28-38
16. Walsh L (2008) "SNMP Mib Handbook", Wyndham Press.



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHII (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 10.04.2017 <http://T-Science.org>



Shafa Tiflis Aliyev
Doctor of Economic Sciences,
Associate Professor of "World economy",
Sumgait State University,
Azerbaijan Republic
nauka-xxi@mail.ru



Sabina Jeyhun Israilova
student II course faculty
"Economics and Management",
Sumgait State University
Azerbaijan Republic
tedqiqat.elm@gmail.com

SECTION 34. Tourism.

THE PROBLEMS AND WAYS OF DEVELOPMENT OF TOURISM SECTOR IN AZERBAIJAN

Abstract: The problems and ways of development of the tourism sector in Azerbaijan are discussed in this article. The existing problems hindering the development of the tourism sector as profitable and promising sectors of the national economy are examined on the basis of the analysis. The potential of tourism development in Azerbaijan, taking into account its geographical location and climate diversity, national custom, ancient culture, attractions are revealed. The importance of intensifying the development of tourism as efficient sector of the economy to minimize the impact on the oil factor is substantiated. The important aspects and future directions of expansion of tourist services and the overall development of tourism are identified. A number of proposals to address the problems and ways of development of the tourism sector in Azerbaijan in the near future are given.

Key words: Azerbaijan, problems of development of tourism in Azerbaijan, ways of tourism sector development in Azerbaijan, tourist services in Azerbaijan, prospects of development of tourism in Azerbaijan.

Language: Russian

Citation: Aliyev ST, Israilova SJ (2017) THE PROBLEMS AND WAYS OF DEVELOPMENT OF TOURISM SECTOR IN AZERBAIJAN. ISJ Theoretical & Applied Science, 04 (48): 30-35.

Soi: <http://s-o-i.org/1.1/TAS-04-48-6> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.6>

ПРОБЛЕМЫ И ПУТИ РАЗВИТИЯ СЕКТОРА ТУРИЗМА В АЗЕРБАЙДЖАНЕ

Аннотация: В данной статье рассматриваются проблемы, и пути развития сектора туризма в Азербайджане. На основе анализа изучаются существующие проблемы, мешающие развитию туристического сектора, как одной из рентабельных и перспективных отраслей национальной экономики. Раскрыты потенциальные возможности развития туризма в Азербайджане с учётом его географического местонахождения и разнообразности климата, национальных обычаев, древней культуры, достопримечательностей. Обоснована важность интенсификации развития туризма, как эффективного сектора экономики страны по минимизации влияния от нефтяного фактора. Определены важные аспекты и перспективные направления расширения туристических услуг и в целом развития туризма. Дан ряд предложений по решению проблем и путей развития сектора туризма в Азербайджане в ближайшей перспективе.

Ключевые слова: Азербайджан, проблемы развития туризма в Азербайджане, пути развития сектора туризма в Азербайджане, туристические услуги в Азербайджане, перспективы развития туризма в Азербайджане.

Introduction

После приобретения независимости в Азербайджане одной из главных проблем было формирование оптимальной модели экономического развития национальной экономики. Однако в первые годы независимости

– в начале 1990-х годов осуществить эту сложную задачу было не так просто. В стране, после распада СССР, разрушились кооперационные и хозяйственные связи не только с другими республиками, но даже внутри республики оборвались традиционные

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	ПИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

хозяйственные отношения. Более того, в стране не было реальных условий и финансовых средств для модернизации различных секторов национальной экономики. Благодаря заключённому «Контракту века», 20 сентября 1994 года, Азербайджан получил исторических шанс привлечения крупных инвестиционных ресурсов на основную отрасль экономики страны – на добывающую сферу. Конечно, с одной нефтью невозможно построить оптимальную структуру национальной экономики и повысить её конкурентоспособность. Однако нефтяной фактор положительно повлиял на улучшении бизнес-среды и предпринимательскую деятельность в стране, ускорилось проведение основных циклов и фаз экономических реформ, практически с нуля создавалась законодательная база развития предпринимательства и рыночных отношений, ускорились создание соответствующих рыночных инфраструктур и рыночных механизмов, в целом нефтяной фактор послужил ролью ведущего локомотива экономики страны. С увеличением притока нефтедолларов повысился, и объём валютных запасов Азербайджана и это дало возможность для модернизации других секторов экономики страны, в то же время создания более выгодной, одновременно новой для страны сферы национальной экономики, одной из которых является сфера туризма.

Materials and Methods

Туризм является прибыльной сферой деятельности, и служит хорошей основой для опознания страны, для представления его национальных достопримечательностей, культуры, истории, старых обычей и обрядов, традиций, фауны и флоры и прочее. Более того, приток многомиллионных туристов способствует расширению сети туристических предприятий, центров, маршрутов, которые положительно влияют на повышение экономической активности регионов страны, увеличение занятости, активизации деятельности секторов услуг и их доходов, в целом обеспечивает увеличение доходов населения и рост национальной экономики. Более того, туризм повышает имидж страны и побывавшие здесь иностранные туристы получают больше информации о стране и её культуре. Туризм серьёзно влияет на решение социально-экономических проблем страны. Изучая данные проблемы, исследовать В.Морозов отмечает, что при прямом влиянии, расходы туристов непосредственно формируют доходы предприятия сферы туризма, а при косвенном – прямое воздействие туризма генерирует рост спроса в сопряжённых отраслях. В условиях экономического роста, становится важным усиление косвенного государственного

регулирования сферы туризма, создание возможностей для формирования инфраструктуры, привлечение инвестиций, укрепление хозяйственных связей[1]. В случае эффективности государственной поддержки и создания благоприятных условий, расходы окупаются в течение нескольких лет, и выигрыш государства заключается в развитии одной из инклюзивных отраслей экономики, положительно оказывающей влияние на решение социально-экономических проблем, улучшение уровня благосостояния населения, развитие предпринимательства в туризме и прочее. По мнению исследователя С.Зерновой, в современном мире туризм рассматривается, как социально-экономическое явление, оказывающее прямое и опосредованное влияние на развитие всей связанной с ней инфраструктуры. Туризм, как подсистема сферы услуг, имеет свою типологию и функции, которые позволяют определить его, как автономную сферу хозяйствования. Он сочетает в себе различные виды рекреационной деятельности – оздоровления, познания, восстановления производительных сил человека и феномен туризма является предметом изучения различных отраслей гуманитарного знания, а регулирование предпринимательства в туризме является одним из важных направлений государственного регулирования экономики[2]. Государство, в благоприятных условиях для развития своей национальной экономики должно обратить пристальное внимание на развитие туризма, так как туризм наряду с развитием в качестве одной из важных сфер национальной экономики, в то же время обеспечивает социальное демпфирование, обеспечение сохранения тысячи рабочих мест, развитие инновации и привлечение ресурсов регионов в хозяйственный оборот и рост объёма услуг. Формирование механизма государственной поддержки предпринимательства в туризме позволит эффективно взаимодействовать субъектам предпринимательства и органам государственной власти. Это, в конечном итоге, приведёт к росту объёмов и качеству туристских услуг, увеличению налоговых поступлений в бюджет[3]. Развитие туризма и тем более, эффективной государственной поддержки происходит во многих странах мира, так как в настоящее время рост туристской активности населения во всём мире является важным фактором, влияющий на социальную, культурную и экономическую жизнь стран. Современный этап развития предпринимательской деятельности в туризме, который начался в конце прошлого века, характеризуется ростом туристских потоков, созданием большого количества новых туристских предприятий, формированием

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	ПИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

туристской инфраструктуры[4]. Более того, развития предпринимательства в туристическом бизнесе требует решение ряд проблем связанных тенденции и вызовов, вызванное глобализации мировых экономических процессов. Глобализация – один из основных трендов в индустрии международного туризма, сопровождаемый концентрацией доли рынка и влиянием в руках крупных компаний. Эти компании, помимо этого имеют возможность распределять риск, между различными рынками применяя современные материалы маркетинговых схем и доступа на международный рынок труда, также выигрывают и от активного внедрения новых технологий[5]. Дело в том, что во многих странах вопросы развития туризма и специализации на туристическом рынке считаются решающими для заполнения доходов бюджета страны и поэтому им необходимо провести последовательную государственную политику с применением современных механизмов управления, обновленной маркетинговой подходов и схем и внедрением новейших технологий по интенсификации развития туризма в своих странах, что и делается сейчас в Азербайджане. Правда, туристический сектор не является той отраслью народного хозяйства, от которой зависит судьба и заполнение доходной части государственного бюджета Азербайджана, однако туристический сектор объявлен одним из приоритетных направления развития экономики страны. Поэтому активно расширяется материально-техническая база туризма, строятся самые современные отели, туристско-рекреационные комплексы, базы отдыха и процесс применением новейших технологий и лучшего опыта мировых туристических компаний по эффективному управлению туристической деятельности. Исследовательница, О.Барсукова, справедливо подчёркивает, что особенности маркетинга туризма оказывают существенное влияние на понимание и реализацию концепции маркетинга в туризме. Туристский маркетинг должен максимально учитывать такие факторы: 1) туризм является не только экономическим, но одновременно социальным, культурным, экологическим и политическим явлением; 2) услуги отличаются от товаров, как традиционно выделяемыми особенностями, так и вновь выделенными; 3) рынок услуг обладает рядом особенностей; 4) специфичен туристский продукт; 5) комплекс маркетинга включает компоненты по продвижению услуг; 6) маркетинговая деятельность осуществляется субъектами различных уровней управления. Учёт специфики маркетинга туризма позволит субъектам маркетинга разрабатывать эффективные

маркетинговые стратегии и инструменты[6]. К большому сожалению многие туристические компании и субъекты предпринимателей в туристическом секторе не осознавая важность и последовательное осуществлении маркетинговых подходов, маркетинговой политики допускают серьёзные просчёты в прогнозировании и планировании своей деятельности, в результате чего лишаются возможности укрепиться в туристическом рынке, тем самым замедляются темпы роста и развития в целом туристического сектора страны. Необходим комплексный подход в формировании и развитии туристического рынка в современных условиях с учётом разработки и осуществления, оптимальных организационно-экономических механизмов и инструментов. С.Ахмедханова считает, что эффективная направленность управления может обеспечить развития туристскому предприятию быстрее, нежели рост общей экономики или туристского сектора, или даже производства товаров и услуг, связанных и обеспечением туризма...Предмет управления в сфере туризма многообразен. Это, во-первых, экономический механизм и организационная структура. Во-вторых, маркетинг и информационно-рекламные технологии. В-третьих, персонал - менеджеры, специалисты, другие работники, составляющие систему управления[7]. Проблемы и организационные вопросы по эффективности туристической деятельности обуславливают решение вопросов, связанных с рациональностью применяемых механизмов и практических инструментов туристической деятельности, привлекательность отдельных туристических услуг, увеличение разнообразности туристических услуг с обеспечением доходности отрасли. За последние десятилетия стали больше применение инновационных механизмов и инструментов по развитию предпринимательства в сфере туризма[8]. Более того, каждый турист должен получить удовлетворение и максимум удобства от представленных туристических услуг, наслаждаться их многообразием в плане рационально отдыха и духовного обогащения. Туристическая деятельность должна отличаться креативностью и инновативностью[9]. Туристы должны чувствовать и окружаться комфортностью, иметь одновременно возможность выбора активного и пассивного отдыха, в то же время развлекательных и культурных мероприятий. В целом, туризм требует постоянных находчивых решений и обдуманных поступков предпринимателей для удивления туристов с расширением содержательных видов туристических услуг[10]. На наш взгляд, в ближайшей перспективе в мире появится более обновлённые и продуктивные механизмы в контексте

Impact Factor:

ISRA (India) = 1.344
ISI (Dubai, UAE) = 0.829
GIF (Australia) = 0.564
JIF = 1.500

SIS (USA) = 0.912
ПИИЦ (Russia) = 0.234
ESJI (KZ) = 3.860
SJIF (Morocco) = 2.031

ICV (Poland) = 6.630
PIF (India) = 1.940
IBI (India) = 4.260

углубления влияний глобальных изменений на туристическую деятельность.

Как мы отметили, туристическая сфера для Азербайджанской экономики является новой отраслью и требует кропотливой, долгой работы по формированию и развитию оптимальной модели развития туристического сектора страны. С этой целью за последние десятилетия проведены не малые мероприятия и укреплена законодательная база развития туризма. Закон Азербайджанской Республики «О Туризме», принятый 4 июня 1999 года способствует развитию туризма и статья – данные законы регулируют государственные принципы туристической деятельности[11]. В нём говорится, что государство, признавая туристскую деятельность одной из приоритетных отраслей экономики Азербайджанской Республики, содействует туристской деятельности и создаёт благоприятные условия

для её развития, определяет и поддерживает приоритетные направления туристической деятельности, осуществляет, поддержку и защиту Азербайджанских туристов, туроператоров, турагентов и их объединения. Всё это положительно влияет на развитие туризма в Азербайджане. Азербайджан расположен в юго-восточной части Закавказского региона и выступает в роли «золотых ворот» между загадочным далёким Китаем и богатой Европой[12]. В результате принятых государственных мер в стране создана современная гостинично-сервисная инфраструктура, налажена подготовка кадров для туристической индустрии[13]. Все эти факторы дали возможность добиться неплохих результатов в разных сферах туристического сектора. В Таблице 1 даны основные показатели туристического сектора Азербайджанской Республики за 2010-2015 годы.

Таблица 1
Основные показатели туристического сектора Азербайджанской Республики за 2010-2015 годы

Индикатор	2010	2011	2012	2013	2014	2015
Всего занятых в туризме работников, человек из них:	1418	1541	1730	1729	1794	1586
Непосредственно занятых туристской деятельностью, человек	1159	1279	1473	1515	1567	1308
Число туристских организаций	126	141	170	197	218	243
Количество проданных туристских путевок, число	34121	42583	62866	65448	66233	44615
Количество проданных туристских путевок для путешествия внутри страны, число	3385	4045	5121	7078	6990	4695
Количество проданных туристских путевок для путешествия за рубеж	27030	34254	52378	53771	54900	38002
Количество проданных туристских путевок иностранным гражданам для путешествия внутри страны	3706	4284	5367	4599	4343	1918
Число туристов прибывших и выехавших, в том числе:	69923	83620	101431	91961	92305	61965
Число прибывших туристов	17641	18840	23440	10605	10657	2009
Число выехавших туристов	52282	604780	77991	81356	81648	59956
Число агентств по путешествию и туроператоров, в том числе:	126	141	170	197	218	243
Государственные	2	2	2	3	2	2
Частные	119	135	161	187	207	227
Иностранные	3	3	3	4	5	6
Совместные	2	1	4	3	4	8
Число отелей и аналогичных предприятий, в том числе:	499	508	514	530	535	536
Государственные	37	34	27	27	27	49
Частные	447	460	466	485	489	470
Иностранные	12	11	17	13	13	12
Совместные	3	3	4	5	6	5
Добавочная стоимость, созданная в туристических сферах, млн. манат	-	-	-	2080,2	2404,2	2437,3

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	ПИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

Доля добавочной стоимости, созданной в туристических сферах в ВВП страны, %	-	-	-	3,6	4,1	4,5
Объём инвестиций, вложенных в туристическую сферу, млн. манат	949,2	1407,8	1478,2	1371,0	2204,0	1063,9

Источник: составлено автором на основе данных статистического издания «Туризм в Азербайджане – 2016 год» Государственного Статистического Комитета Азербайджанской Республики. <http://www.stat.gov.az>.

Как видно из Таблицы 1 за 2010-2015 годы число занятых в туризме работников выросло и число туристических организаций от 126 в 2010 году выросло до 243 в 2015 году. Количество проданных туристических путёвок за этот период выросло почти в 2 раза. Однако, в Азербайджан прибывает меньше туристов, чем выезжают за границу, о чём свидетельствуют данные 2015 года, где число прибывших туристов составляет 2009, а число выехавших – 59956. К сожалению, последние годы негативные последствия финансового кризиса в мире и падения цен на нефть серьёзно повлияли на деятельность туристического сектора Азербайджана и ухудшение основных показателей в 2015 году больше всего связаны с этими факторами. Должны отметить, что снизился объём вложенных в туристическую сферу инвестиционных ресурсов, так, если в 2014 году данная цифра составила 2204 млн. манат, то в 2015 году лишь – 1063,9 млн. манат. Исходя из сложившейся ситуации считается целесообразным пересмотр стратегических целей и механизмов развития туризма в Азербайджане. Ведь, страна имеет выгодное географическое и стратегическое положения для развития туристической сферы. Однако необходимо интенсифицировать проводимые работы по повышению качества и структуры туристических услуг. И решение множества проблем, которые мешают развитию туристического сектора. Исследователь, А.Мирзоев отмечает, что для развития туризма в Азербайджане необходимо формировать более привлекательную туристскую среду и формировать конкурентоспособные туристские продукты [14, с.17]. Кроме того, в условиях необходимости уменьшения зависимости экономики Азербайджана от нефтяного фактора требуется расширение роли других секторов, в том числе туристического сектора национальной

экономики страны и, в целом по диверсификации. Поэтому требуется расширить конкурентную среду в национальном туристическом рынке, стимулирование сбалансированного развития туризма в регионах страны [15, с.3]. Тем более, в последние годы приняты ряд стратегических мер по развитию туризма в целом в стране, в том числе и в регионах. Распоряжением Президента Азербайджанской Республики о финансировании некоторых мер, связанных с развитием туризма в Азербайджанской Республики от 1 сентября 2016 года и Распоряжением Президента Азербайджанской Республики «О дополнительных мерах по развитию туризма в Азербайджанской Республике» от 14 сентября 2016 года предусмотрено усиление материально-технической базы и финансирования туристического сектора страны [16; 17]. И наконец, в рамках принятых стратегических дорожных карт по национальной экономике и основным сектором экономики страны утверждена от 6 декабря 2016 года «Стратегическая дорожная карта относительно развития индустрии специализированного туризма в Азербайджанской Республике» [18].

Conclusion

Таким образом, можно отметить, что туристический сектор в Азербайджане находится на пороге больших изменений в сторону интенсификации развития инфраструктуры, материально-технической базы, географии и перечня других туристических услуг. Ожидается, что туристический сектор в ближайшей перспективе станет одной из привлекательных и инклюзивных отраслей национальной экономики, будет способствовать открытию новых рабочих мест, экономической активности регионов страны и т.д.

References:

1. Morozov VA (2004) Sotsial'no-ekonomicheskiye osnovy vzaimodeystviya turizma so smezhnymi otraslyami natsional'noy ekonomiki. Diss. dr. of econ. scien. Moscow, 2004. -226 p.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

- Zernova SV (2010) Mekhanizm realizatsii gosudarstvennoy podderzhki form predprinimatel'stva v turizme Leningradskoy oblasti. Diss. cand. of econ. scien. St.Peterburg, 2010.-204 p.
- Yuts AY (2010) Mekhanizm gosudarstvennoy podderzhki malogo predprinimatel'stva v turizme//Rossiyskoye predprinimatel'stvo.-2010. -№11(2)-P. 118-124.
- Morozov MA (2006) Infrastrukturnoye obespecheniye predprinimatel'skoy deyatel'nosti v turizme: teoriya i metodologiya formirovaniya i razvitiya. Diss. dr. of econ. scien. Moscow, 2006.-365 p.
- Tsypurdeyeva YD (2006) Razvitiye predprinimatel'stva v turistskom biznese. Diss. cand. of econ. scien. St.Peterburg, 2006.-174 p.
- Barsukova ON (2012) Marketing v razvitii rynka vnutrennego turizma. Diss. cand. of econ. scien. Novosibirsk, 2012.-179 p.
- Akhmedkhanova ST (2008) Organizatsionno-ekonomicheskiye osnovy formirovaniya i razvitiya turistskogo rynka v sovremennykh usloviyakh. Diss. cand. of econ. scien. Makhachkala, 2008.-162 p.
- Omerzel DG (2015) Innovativeness in Tourism: Model Development//Procedia Economics and Finance, Volume 23, 2015.-p. 750-756.
- Liu Haiying (2011) Analysis on Service Engineering Innovation of Tourism Based on Process Metaphysics//Systems Engineering Procedia, V.1, 2011.-p. 344-350.
- Solvoll S, Alsos AG, Bulanova O (2015) Tourism Entrepreneurship – Review and Future Directions//Scandinavian Journal of Hospitality and Tourism, 2015, Volume 15, No 1. -p. 120-137.
- (1999) Zakon Azerbaydzhanskoy Respubliki «O Turizme». 04.06.1999, № 674-IQ.
- (2017) Fakty ob Azerbaydzhane. Available: <http://www.mct.gov.az> (Accessed: 10.04.2017).
- (2017) Turizm v Azerbaydzhane. Available: <http://www.mct.gov.az> (Accessed: 10.04.2017).
- Mirzoyev AF (2016) Napravleniya povysheniya effektivnosti ispol'zovaniya turistskogo potentsiala v Azerbaydzhane. Diss. dr. of phil. in econ. Ganja, 2016.-23 p.
- Gasnov AN (2016) Formirovaniye strategii razvitiya regional'nykh turistskikh kompleksov. Diss. dr. of econ. scien. Ganja, 2016.-47 p.
- (2016) Rasporyazheniye Prezidenta Azerbaydzhanskoy Respubliki o finansirovanii nekotorykh mer, svyazannykh s razvitiyem turizma v Azerbaydzhanskoy Respubliki. 01 September 2016, Baku.
- (2016) Rasporyazheniye Prezidenta Azerbaydzhanskoy Respubliki «O dopolnitel'nykh merakh po razvitiyu turizma v Azerbaydzhanskoy Respublike». 14 September 2016, Baku.
- (2016) Ukaz Prezidenta Azerbaydzhanskoy Respubliki ob utverzhdenii strategicheskikh dorozhnykh kart po natsional'noy ekonomike i osnovnym sektoram ekonomiki. 06 December 2016, Baku.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 11.04.2017 <http://T-Science.org>

Ganiyu Adedayo Ajenikoko

Department of Electronic & Electrical Engineering,
Ladoke Akintola University of Technology,
P.M.B. 4000, Ogbomoso, Nigeria
ajeedollar@gmail.com

Oluwatoyin Abdullateef Salami

Department of Electronic & Electrical Engineering,
Ladoke Akintola University of Technology,
P.M.B. 4000, Ogbomoso, Nigeria

SECTION 6. Metallurgy and energy.

DEVELOPMENT OF A GENERALIZED TWO-PARAMETER TEMPERATURE BASED LINEAR MODEL FOR ASSESSMENT OF SOLAR IRRADIANCE ON NIGERIAN GEO-POLITICAL ZONES

Abstract: The output of light energy from the entire core of the sun measured at the earth is called the solar irradiance. The epileptic nature of power supply has made it a challenge to provide sufficient power and energy to the growing population. This paper develops a generalized two-parameter temperature based linear model for assessment of solar irradiance on Nigerian geo-political zones. The minimum and maximum monthly mean daily ambient temperature as well as the monthly mean daily global solar radiation from natural were collected and analysed over a twenty year period for seven selected locations on Nigerian geo-political zones. Appropriate mathematical notations were used to perform a stochastic analysis on the collected data to develop a generalized model. The performance evaluation of the generalized model was done by computing the t-value in terms of the mean-bias error (MBE) and the root mean square error (RMSE) with the analysis done at 95% confidence level. A low MBE value of 0.0327 suggests a good long-term representation of the physical problem.

The RMSE which was in the range of 0.1835 to 0.2887 is dilates the efficiency of the generalized model. Sokoto has a relatively high annual solar irradiance and far much more than the 1.361KW/m²/d benchmark. Maiduguri has the highest annual irradiance as compared to other locations used as case studies in this research paper. It also has the highest potential for the generation of solar energy. Maiduguri with an annual average solar irradiance of 5.89kWh/m²/d is the least site under consideration. This signifies that Nigeria is a good site for solar exploration and has high solar energy feasibility, as Port-Harcourt (the site with lowest solar irradiance) is significantly above the standard value of annual average solar irradiance. Even though, the solar radiation is generally high throughout the year in Maiduguri, February – April appeared as the months with the highest solar radiation. August appeared as the month with lowest solar radiation. Jos had the best solar irradiance in the country thus representing a place of huge potential in the solar exploration market. Enugu and Port-Harcourt had low solar irradiance compared to other locations used in this paper. The global solar radiation intensity produced by the generalized model developed can be used in the design, analysis and performance estimation of the solar conversion system. The estimation of the average daily global solar radiation which is necessary for optimal economic sizing of solar photovoltaic systems will encourage extensive use of solar energy, which is an essential solution for high atmospheric pollution caused from fossil fuel combination.

The result from the research work shows that most parts of Nigeria have a very high climatic feasibility of generating renewable energy using solar energy that can be utilized for off grid rural electrification and further increase the total energy accessibility in the country.

Key words: Solar Irradiance, Climate Feasibility, Solar Energy, Renewable Energy, Solar Power, Generalized, RMSE, MBE, Global Solar.

Language: English

Citation: Ajenikoko GA, Salami OA (2017) DEVELOPMENT OF A GENERALIZED TWO-PARAMETER TEMPERATURE BASED LINEAR MODEL FOR ASSESSMENT OF SOLAR IRRADIANCE ON NIGERIAN GEO-POLITICAL ZONES. ISJ Theoretical & Applied Science, 04 (48): 36-48.

Soi: <http://s-o-i.org/1.1/TAS-04-48-7> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.7>

1. Introduction

Solar irradiance is the output of light energy from the entire core of the sun, measured at the earth. It is measured in kWh/m²/d. According to satellite observations of total solar irradiance, the average

value of solar irradiance was thought to be approximately 1.366kWh/m²/d varying slightly with solar activity, but recent calibrations of the relevant satellite observations indicate a value closer to 1.361kWh/m²/d [NASA]. Dharnai village in the

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

North-western state of Bihar has successfully constructed a solar micro-grid of 100-kilowatt (kW), 70kW electricity generation, and 30kW for 10 solar-powered water-pumps, supply power and water to the village's 450 homes, 50 commercial operations, two schools, training centre and health care facilities. Battery storage ensures power around the clock. By implementing such scheme, Nigeria can effectively bridge the gap between black-out and total electricity [[18], [19], [12], [17], [26]].

Even with the recent reforms in the power sector, more than half of the country's population still lack access to electricity. The epileptic condition of the power sector can be attributed to the inadequate and inefficient power plants, poor transmission and distribution facilities and out-dated metering system used by electricity consumers. Suleiman Lawal Nadabo (2010) worked on Renewable Energy as a solution to Nigerian energy crisis. He investigated the potentials of renewable energy sources in Nigeria and how to support, promote and encourage the growth of renewable energy resources in Nigeria to close the gap of 60-70% of Nigerians that did not have access to energy that is environmentally friendly [[4], [8], [11], [2]].

Global solar radiation (GSR) is the sum of the direct and the diffuse solar radiation on a surface. The direct solar radiation is the solar radiation received from the sun without being scattered by the atmosphere. The diffused solar radiation is the solar radiation received from the sun with its direction changed due to scattering by the atmosphere. The knowledge of the availability of GSR data is of fundamental importance in order to utilize solar energy economically and efficiently. The direct normal irradiation (DNI) is very significant in concentrating solar thermal installations that track the position of the sun. This is essential for the design and evaluation of solar energy conversion system. GSR data are not measured at the forty-five meteorological stations in Nigeria. In the absence of these data, one has to rely on available methods of estimation as well as developing new ones. The availability of such data will encourage possible analysis of application and efficient utilization of solar energy in order to control GHG emissions [[16], [23], [1], [10]].

GSR is an important parameter necessary for most ecological models and serves as input for different photovoltaic conversion system, hence it is of economic importance to renewable energy alternative. The solar radiation reaching the earth surface depends on the climatic condition of the specific site location and this is necessary for accurate prediction and design of a solar energy system. When global solar radiation is used to generate electrical energy for any specific site location, a provision should be made to forecast solar energy which will convert it to electrical energy to

recover the load demand, that is, the amount of solar energy for that place has to be known. Technology for measuring GSR is very expensive and has instrumental hazards. Though, solar radiation data are available in most meteorological stations, many stations in developing countries including Nigeria suffer from a shortage of these data. Alternative methods for estimating these data are necessary. One of these methods is the use of empirical models. Accurate modelling depends on the quality and quantity of the measured data used and is a good tool for generating global solar radiation at locations where measured data are not available.

Power and energy serve as indicators to the socio-economic development of a country. Electricity can be used as a yardstick to differentiate between the developed countries and the developing countries. Developed countries are continuously using their advanced technology in implementing new ways to generate enormous amount of power in order to satisfy their corresponding high power demand and thus paving way for further industrial and economic growth. Developing countries in which Nigeria is not left out however are several miles away to reach the power and energy prowess of the developed countries and this can be associated to the weak administrative structure, corruption in the necessary quarters, high population density and lack of adequate technical know-how regarding application of scientific methods towards maximum utilization of the available resources [[32], [29], [6], [5]].

Since electricity is very important for economic development of a country, finding a solution to end the aged long power problems of Nigeria is very imperative, one can learn from developed countries in the world that now generate more than enough electricity used to power households and industrial establishments. Countries like Germany, Spain and other European heavyweights are now running fully on power generated with the use of 100% renewable energy scheme.

1.1 Renewable Energy

Renewable energy is defined as energy collected from resources which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat. It refers to a type of energy which occurs naturally and is theoretically believed to be an inexhaustible source of energy. Renewable energy often provides energy in at least four important areas: electricity generation, air and water heating/cooling, transportation, and off-grid energy services [2]. One of the major advantages of renewable energy is that the primary sources (sun, water, wind) are very much free in nature and inexhaustible. This means that the cost of generating energy when making use of renewable energy is relatively cheap [[28], [25], [31], [30]].

1.2 Solar Energy for rural electrification

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHII (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

Solar energy is simply defined as the energy gained by the earth as a result of light radiations from the sun. It is a very important and the most widely used form of renewable energy all around the world because the sun is a universal body. Solar energy has a wide range of applications and most especially it is used for power generation, domestic and commercial uses [[9], [13]]. A solar power system is a system assembled using the basic components required to produce electrical energy from the sun. It comprises of the connection of solar panel/module (a group of individual solar cells connected in series, parallel or series-parallel combinations to produce a standard output), charger controller (an electronic device that regulates the voltage from the solar panel array to ensure maximum transfer of energy and prevent over-charging of the battery bank), a power inverter (an electronic device that convert 12,24,48, or

higher volts DC from batteries or solar panels to 120/240 volts AC to operate appliances and battery bank [[3], [21], [20], [7], [14]].

The need for a well-structured renewable energy scheme which exploits the climatic condition of these rural areas is very necessary. Most locations in Africa are characterised by high sunshine which makes solar energy, a very logical choice of renewable energy especially in the Sahara (North Africa) where country like Morocco now run the power generation fully on Solar energy [[24], [27], [15], [22]].

1.3 Locations Considered in the Analysis

Seven locations: - Sokoto, Kaduna, Maiduguri, Jos, Ogbomoso, Enugu and Phort-Harcourt were considered in the analysis and their geographical locations on Nigerian map are as shown in Figure 1.



Figure 1 - Map of Nigeria showing the seven locations.

Since metrological data were not readily available for most rural areas in which off-grid electrification is intended, the main city close to areas were chosen. The latitudes and longitudes of both places are similar.

1.3.1 Sokoto

Sokoto is located in the North-west of Nigeria near the conference of Sokoto River and Rima River. It is the capital city of Sokoto state.

1.3.2 Kaduna

Kaduna is the state capital of Kaduna state in North central of Nigeria. On the Kaduna river, is a trade centre and a major transportation hub for the surrounding agricultural areas with its rail and road junction. With an annual average temperature of 24.6°C, Kaduna is a good place for Solar Energy exploration for off-grid electrification. It also has a very thick population.

1.3.3 Maiduguri

Maiduguri is the capital and the largest city of Borno State in north-eastern Nigeria. It is located at latitude 11°50'N of the equator, and a longitude of 13°09'E. The city sits along the seasonal Ngadda River which disappears into the Firki swamps in the areas around Lake Chad. Köppen-Geiger climate classification system classifies its climate as hot semi-arid. It has a temperature of as high as 45°C in the day and as low as 15°C when night falls. The highest record temperature was 47 °C, while the lowest record temperature was 5°C. This high temperature contributed to why Maiduguri is considered as a place of high potential in solar energy exploration for rural electrification.

1.3.4 Jos

Jos is located in the Middle Belt of Nigeria with a population of about 900,000 residents based on the 2006 census. Popularly called "J-town", it is the administrative capital of Plateau State. It is located at latitude of 9°56'N of the equator and at a longitude of

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHIQ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

8°53'E. It has a very high elevation, probably the highest in the country. Jos enjoys a more temperate climate than many of the rest of Nigeria. Average monthly temperatures range from 21–25 °C (70–77 °F), and from mid-November to late January, night-time temperatures drop as low as 11 °C.

1.3.5 Ogbomoso

Ogbomoso is a city in Oyo State, south-western Nigeria. It is located at latitude 8°08'N of equator and a longitude of 4°15'E. The city has a tropical climate. The average annual temperature in Ogbomoso is 26.1 °C. The temperatures are highest on average in March, at around 28.5 °C. August tends to have the lowest temperature of 24.0 °C on an average.

1.3.6 Enugu

Enugu is the capital of Enugu State in Nigeria. It is located in south eastern Nigeria with a population of 722,664 according to the disputed 2006 Nigerian census and nearly 2 million according to 2015 estimates. It is located at 6°27' 9.60"N latitude of the equator and longitude of 7°30' 37.20"E. The name Enugu implies hill-top though the city lies at the foot of an escarpment and not a hill. Enugu is located in a tropical rain forest zone with a derived savannah.

1.3.7 Port-Harcourt

Port-Harcourt is the capital and largest city of Rivers State and lies along the Bonny River and located in the Niger Delta. According to the 2006 census, the Port Harcourt urban area has a population of 1,382,592. It is located at latitude 4°49'27"N of the equator and longitude 7°21"E. Port Harcourt features a tropical wet climate with lengthy and heavy rainy seasons and very short dry seasons. Only the months of December and January truly qualify as dry season months in the city. Temperatures throughout the year in the city are relatively constant, showing little variation throughout the course of the year. Average temperatures are typically between 25 °C–28 °C.

2. Materials and Method

Development of Mathematical Models

Solar time (t_s): which is based on apparent angular motion of the sun across the sky is given by:

At solar noon, $t_1 = 12$ h, it is given by:

$$t_s = t_c + E + \frac{\theta}{15^\circ} - Z_e \quad (1)$$

where

t_c is civil time in hours corresponding to the midpoint of each time step.

θ is the longitude in degrees of the site location.

Z_e is the time zone in hours to the east of GMT.

E is the equation of time in hours. Thus,

$$E = 3.82(0.000075 + 0.001868 \cos B - 0.032077 \sin B - 0.014615 \cos 2B - 0.04089 \sin 2B) \quad (2)$$

$$B = (d - 1) \frac{360^\circ}{365} \quad (3)$$

where

d = day of the year, starting with 1 for January 1st, that is $1 \leq d \leq 365$

At the summer solstice on June 21st, it is 23.45° at the winter solstice on December 21st in the northern hemisphere. i.e. $-23 - 45^\circ \leq \delta \leq 23.45^\circ$

At the intervening periods of the year, the solar declination angle can be approximated by a sinusoidal variation as:

$$\delta = 23.45^\circ \sin \left(360^\circ \frac{284+d}{365} \right) \quad (4)$$

where

(δ) Declination angle is the angle made by the line joining the centre of the sun and the earth with its projection on the equatorial plane. At the annual and vertical equinoxes, it is zero.

Hour angle (ω): this is the angular displacement of the sun, East or West of the total meridian due to the rotation of the earth on its axis at 15° per hour, which expresses the time of the day with respect to solar noon is:

$$\omega = (t_s - 12)15^\circ \quad (5)$$

While the sunset hour angle is defined as:

$$\omega_s = \cos^{-1}[-\tan \delta \tan \varphi] \quad (6)$$

where

ω is hour angle in degrees

ω_s is sunset hour angle in degrees.

At any point in time (between sunrise and sunset), the extra-terrestrial horizontal radiation is:

$$I_0 = I_{SC} \left(1 + 0.033 \cos \frac{360d}{365} \right) [\sin \delta \sin \varphi + \cos \delta \cos \varphi] \quad (7)$$

Extraterrestrial radiation on a horizontal surface is the theoretical possible radiation that would be available if there were no atmosphere. The total daily extraterrestrial radiation on a horizontal surface is obtained by integrating equation (7) over the period from sunrise to sunset. i.e.

$$H_0 = \frac{24}{\pi} I_{SC} \left(1 + 0.033 \cos \frac{360d}{365} \right) \times \left[\frac{\pi \omega_s}{180} \sin \delta \sin \varphi + \cos \delta \cos \varphi \right] \quad (8)$$

The monthly mean daily extraterrestrial radiation on a horizontal surface is:

$$\overline{H_0} = \frac{1}{D} \sum_{d_m=1}^D H_0 (d_m) \quad (9)$$

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHIQ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

Where d_m is the day of the month and D is the total number of days in the month.

The ratio of the monthly mean daily global radiation on horizontal surface to monthly mean daily extraterrestrial horizontal radiation is called "Clearance index" given by:

$$K_T = \frac{\bar{H}}{H_0} \quad (10)$$

Mean Bias Error (MBE) is defined as:

$$MBE = \frac{1}{P} \sum_{p=1}^P (\bar{H}_{est} - \bar{H}_{obs}) \quad (11)$$

Root Mean Square Error (RMSE) is defined as:

$$RMSE = \sqrt{\frac{1}{P} \sum_{p=1}^P (\bar{H}_{est} - \bar{H}_{obs})^2} \quad (12)$$

t – Statistic (TS) is defined as:

$$TS = \sqrt{\frac{(P-1)(MBE)^2}{(RMSE^2 - MBE^2)}} \quad (13)$$

where \bar{H}_{obs} is the observed \bar{H} ($kWh/m^2/day$), \bar{H}_{est} is the estimated \bar{H} ($kWh/m^2/day$), and P is the number of observations and it corresponds to the twelve months ($P = 12$) of the year.

Given the data points of the form (x_p, y_p) for $P = 1, 2, \dots, P$, set of point and that y_p depends linearly on x_p , then, for accurate prediction of the set points, it is necessary to obtain the slope m and H – intercept (m_0) of a time that best fits those dataset points, defined by:

$$y_p = m_0 + mx_p \quad (14)$$

If x_p are j independent variables ($x_{1p}, x_{2p}, \dots, x_{jp}$), then equation (14) becomes

$$y_p = m_0 + m_1 x_{1p} + m_2 x_{2p} \pm \dots + m_j x_{jp} \quad (15)$$

The coefficients of determination defined by

$$R^2 = \sum_{p=1}^P (m_0 + m_1 x_{1p} + \dots + m_j x_{jp} - y_p)^2 \quad (16)$$

Where x is the independent variable, j is the number of independent variable which would minimize the sum of squares of the difference between the data and the estimated time and R is the coefficient of correlation.

$$\bar{H}_{Sok} = \bar{H}_0(-1.3142 + 0.3512\bar{R}_T + 0.0632\bar{T}_{max}) \quad \text{for Sokoto} \quad (22)$$

$$\bar{H}_{Kad} = \bar{H}_0(0.2826 - 1.0754\bar{R}_T + 0.0521\bar{T}_{max}) \quad \text{for Kaduna} \quad (23)$$

$$\bar{H}_{Maid} = \bar{H}_0(0.6021 - 0.3214\bar{R}_T + 0.0085\bar{T}_{max}) \quad \text{for Maiduguri} \quad (24)$$

$$\bar{H}_{Jos} = \bar{H}_0(2.5021 - 2.9218\bar{R}_T + 0.0184\bar{T}_{max}) \quad \text{for Jos} \quad (25)$$

$$\bar{H}_{Ogb} = \bar{H}_0(0.2614 - 0.8921\bar{R}_T + 0.0248\bar{T}_{max}) \quad \text{for Ogbomoso} \quad (26)$$

Two independent variables j in equation (16) equals to 2 are assumed. If the dependent variable of equation (16) is the clearance index K and the independent variable are the monthly average daily air temperature ratio, \bar{T}_R and the monthly average daily maximum air temperature \bar{T}_{max} , then equation (16) becomes

$$K_p = m_0 + m_1 \bar{T}_{RP} + m_2 \bar{T}_{maxP} \quad (17)$$

Where the subscripts P ($= 1, 2, \dots, 12$) refers to the monthly average daily dataset for a typical year.

In matrix form, equation (17) becomes

$$\begin{bmatrix} K_1 \\ \vdots \\ K_P \end{bmatrix} = \begin{bmatrix} 1 & \bar{T}_{x1} & \bar{T}_{maxP} \\ \vdots & \vdots & \vdots \\ 1 & \bar{T}_{RP} & \bar{T}_{maxP} \end{bmatrix} \begin{bmatrix} m_0 \\ \vdots \\ m_1 \end{bmatrix} \quad (18)$$

$$\text{i.e. } K = AM \quad (19)$$

where $K = P \times 1$ column matrix, A is $P \times 3$ matrix and M is $(j \times 1) \times 1$ matrix. To solve for A , there is the need to transform A to a square matrix (where $P \neq j \neq 1$).

$$A^T K = A^T AM \quad (20)$$

where A^T is the transpose of A .

If $(A^T A)^{-1}$ exists, then

$$M = (A^T A)^{-1} A^T K \quad (21)$$

The solution of equation (21) is a matrix of empirical constants, $M = [m_0, m_1, m_2]$.

Performance Evaluation

The performance evaluation of the generalized model was done by computing the t-statistic (t-value) in terms of the mean-bias error (MBE), and the root mean square error (RMSE) and the analysis done at 95% confidence level. The t- statistic (t- value) is computed in terms of the mean bias error (MBE) and the root mean square error (RMSE) and analyzed at the 95% confidence level.

The t- statistic is a known statistical tool with an exceptionally satisfactory accuracy for analyzing solar radiation data. The coefficients of determination (R^2) of the estimation model are obtained.

The temperature – based linear regression models for the seven locations used as case studies in this paper are:

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHIQ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

$$\bar{H}_{Enugu} = \bar{H}_0(0.7176 - 0.5864 + 0.0214\bar{T}_{max}) \quad \text{for Enugu} \quad (27)$$

$$\bar{H}_{Port} = \bar{H}_0(0.8214 - 0.6321\bar{R}_T + 0.5889\bar{T}_{max}) \quad \text{for Port - Harcourt} \quad (28)$$

Combining (22) and (28) the generalized two-parameter temperature based linear model is

$$\bar{H} = \bar{H}_0(0.9347 - 0.2894 R_T + 0.3827T_{max}) \quad (29)$$

From equation (22) to (29), it is observed that a significant statistical relationship (with coefficient of correlation COC) of 86.3 to 94.6%) exists between the clearance index, ambient temperature ratio and maximum ambient temperature with linear regression model. Equation 29 can be written as:

$$\bar{H} = \bar{H}_0(m_0 + m_1\bar{R}_T + m_2\bar{R}_{Tmax}) \quad (30)$$

The ambient temperature ratio is

$$\bar{R}_T = \frac{\bar{T}_{min}}{\bar{T}_{max}} \quad (31)$$

where

\bar{H} , \bar{H}_0 , \bar{R}_T , \bar{T}_{min} and \bar{T}_{max} are the respective monthly mean daily horizontal global and extraterrestrial – radiation, minimum to maximum ambient temperature, m_0 , m_1 and m_2 are empirical constants.

The model is very useful in estimating the global solar radiation on horizontal surfaces at different locations on the geopolitical zones in Nigeria.

3. Discussion of results.

Figures 1 to 4 show the empirical constants for the seven selected locations used as case studies in this research paper. Observation shows that Jos has the highest empirical constant of 0.6814 while Sokoto has least empirical constant of - 0.2650 because. Sokoto in the North -Western Nigerian has a relatively high annual solar irradiance and far much more than the 1.361kW/m²/d benchmark. Same goes for the rest, as Kaduna, Maiduguri, Ogbomoso, Jos, Enugu and Port-Harcourt.

A significant statistical relationship with coefficient of correlation (COC) of 94.6% between the clearance index ,ambient temperature ratio and maximum ambient temperature with linear regression model .The COC for Sokoto, Kaduna, Maiduguri and Jos are 92.75%, 94.6%, 86.3% and 91.6% respectively while the COC for Ogbomoso, Enugu, Port-Harcourt are 91.9%, 90.5% and 93.7% respectively as shown in Figure 5-7.

Sokoto has a coefficient of determination COD of 88.6%, Kaduna, Maiduguri and Jos have a COD of 92.2%, 77.9% and 86.5% respectively while Ogbomoso, Enugu and Port-Harcourt have a COD of 87.1%, 84.5% and 82.4% respectively. This is because it is important to note that Maiduguri has the highest annual irradiance in the whole of the sites under consideration, and has the highest potential for the generation of solar energy.

Kaduna has the highest COC of 94.6% and a highest COD of 92.2% as a result of the level of industrial activities in the city. Most of the industries in this city are operating at maximum efficiency. Maiduguri has the least COC and COD of 86.3% and 77.9% respectively because most of industries in this city are not operating at their maximum efficiencies, hence the city is not as industrialized as Kaduna compared to all the cities used as case studies in this research paper.

In order to achieve a more reliable statistical result, an additional tool TS is used since it is possible to have a large value of RMSE as well as small values of MBE. The smaller the value of TS, the better the performance of the models. The TS value of the models developed are within the range of critical value of 1.96 as shown in Figure 8-10. A low TS value of the models developed (0.0498 – 0.7884) shows an excellent performance of the models.

The RMSE values which are a measure of the accuracy of estimation vary from 0.1835 (the least) to 0.2887 (highest) for Kaduna and Maiduguri respectively. This shows that Kaduna city is more industrialized than Maiduguri. Sokoto, Jos, Ogbomoso, Enugu and Port-Harcourt have RMSE values of 0.2848, 0.2416, 0.2213, 0.1520 and 0.2104 respectively. Port-Harcourt recorded the highest MBE value of 0.0724 while Jos recorded the least MBE value of - 0.0426 as illustrated in figure 8. Figure 10 illustrates the relationship between the TS of the selected cities used as case studies. Port-Harcourt recorded the highest TS value of 0.7884 while Maiduguri recorded the least TS value of 0.0498 due to Even though, the solar radiation is generally high throughout the year in Maiduguri, Feb-April represent the months with the highest solar radiation and August is the month with the lowest solar radiation. On the overall this location is the very top site for solar power exploration in Nigeria. The TS values of Sokoto, Kaduna, Jos, Ogbomoso and Enugu are 0.1572, 0.0682, 0.5730, 0.0940 and 0.0983 respectively.

Figure11 shows the relationship between the MBE, RMSE and the TS for the selected locations. The RMSE values vary from - 0.0426 (the least for Jos) to 0.0724 (the highest for Port-Harcourt). The MBE values obtained are positive for Kaduna, Enugu and Port-Harcourt while the MBE values are negative for Sokoto, Maiduguri, Jos and Ogbomoso. This shows that the models vary between over and under estimation of H. The value of MBE from the model for Ogbomoso has the highest underestimation compared to Port-Harcourt.

Jos has one of the best solar irradiance in the country and it represents a place of huge potential in

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

the solar exploration market. Jos has a very high elevation and altitude and can have a potential for exploring a verse array of other renewable energy technologies like wind energy, geothermal etc. Ogbomoso is very similar to Jos in terms of the solar irradiance; it is generally a good place for solar energy exploration.

Enugu and Port-Harcourt have low solar irradiance compared to other locations considered in this research, but is still far higher than the 1.361kW/m²/d standard, but due to load level in this area which might be high due to high commercial activities, hybrid form of off-grid rural electrification will be more efficient in satisfying the energy demand of this site. February to April stood out as the month with the highest solar irradiance, and

therefore the months with highest potential. June to August are characterised with a general drop in energy generated by the sun's radiation.

The cities experienced a decrease in the horizontal global solar radiation from July to October (during raining season) with Ogbomoso having the lowest monthly mean daily horizontal global solar radiation of 4.24kWh/m²/day in June. During dry season period, when others experienced a rapid increase in their solar radiation, only Maiduguri maintained a gradual decrease in the global radiation with a least radiation of 6.23 kWh/m²/day in November. The variation of daily horizontal global solar radiation with months of the year in Maiduguri differs from other cities due to their geographical locations.

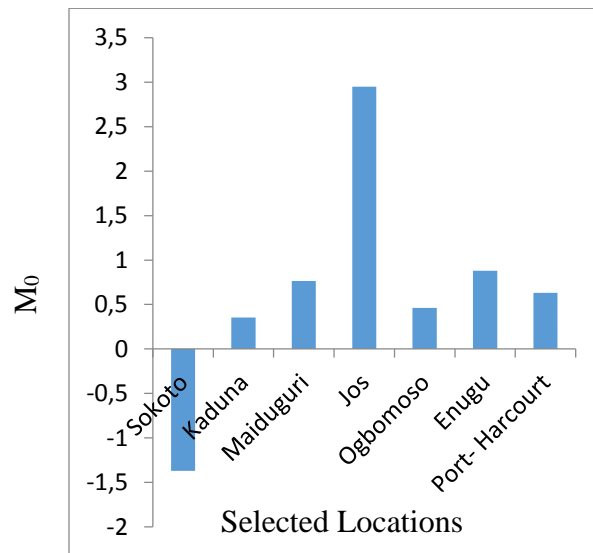


Figure 1 - Empirical Constants (m_0) of the Selected Locations.

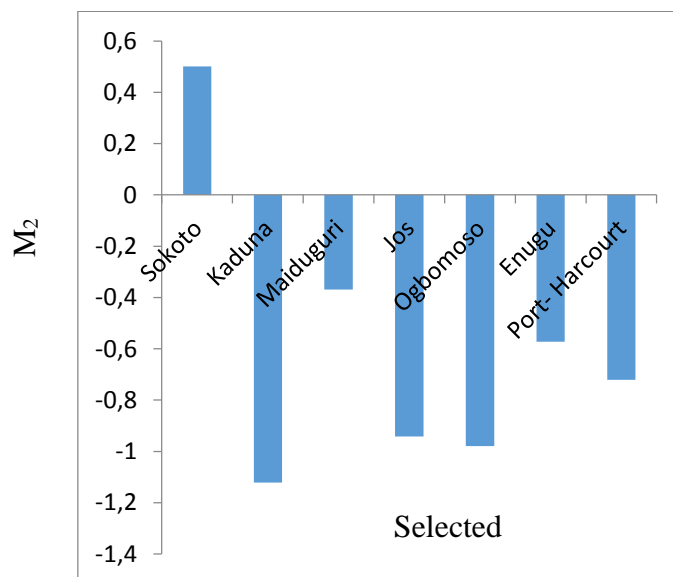


Figure 2 - Empirical Constants (m_2) of Selected Locations.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

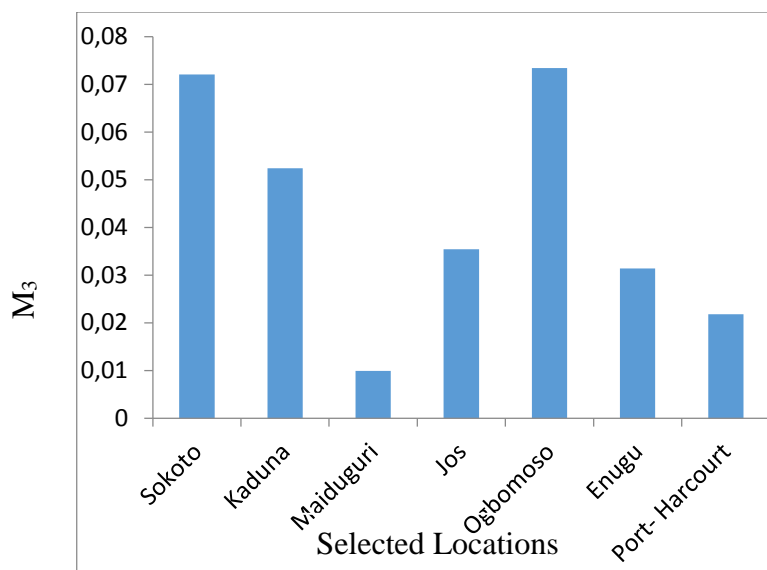


Figure 3 - Empirical Constants (m₃) of the Selected Locations.

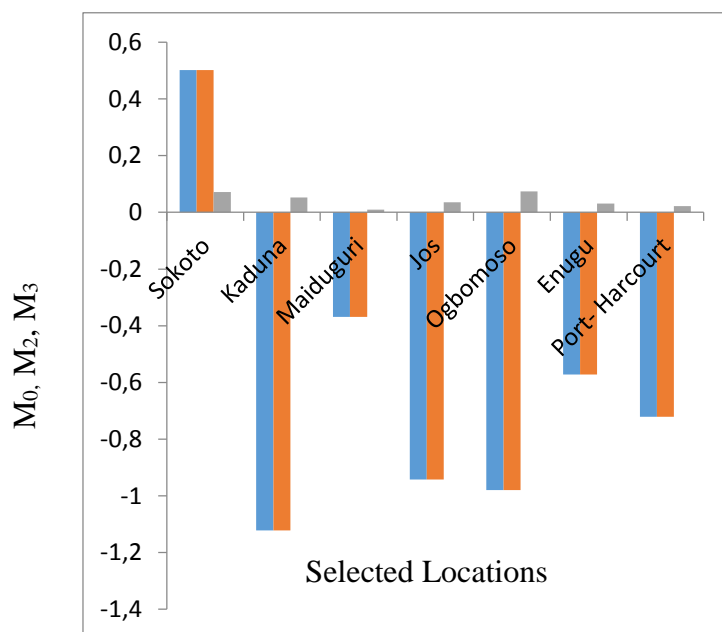


Figure 4 - Combined Empirical Constants of the Selected Locations.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

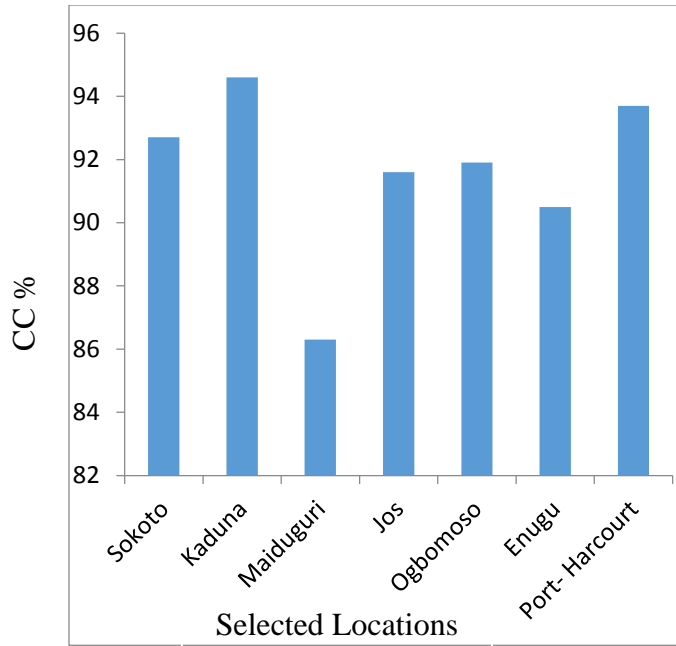


Figure 5 - Coefficients of Correlation of the Selected Locations.

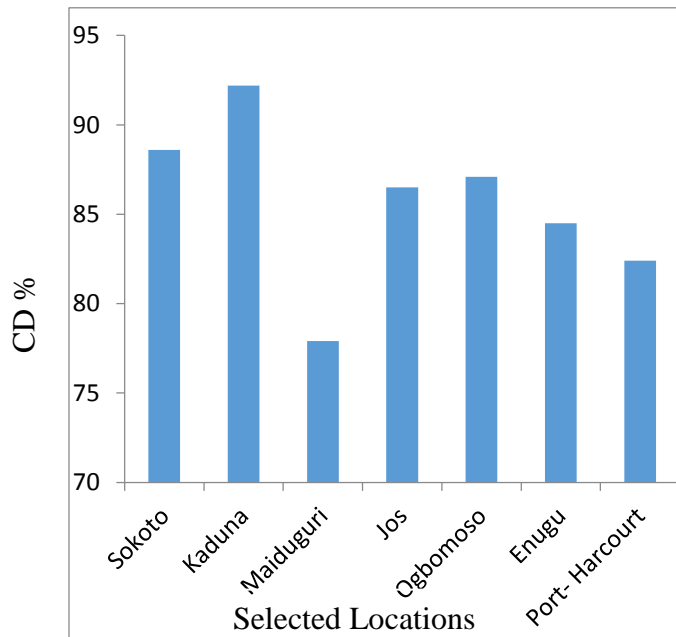


Figure 6 - Coefficients of Determination of the Selected Location.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

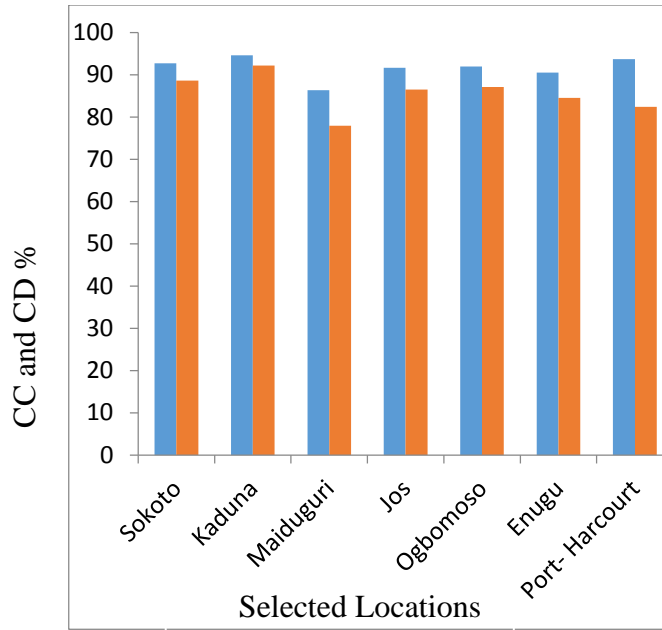


Figure 7 - Coefficients of Correlation and Coefficient of Determination of the Selected Location.

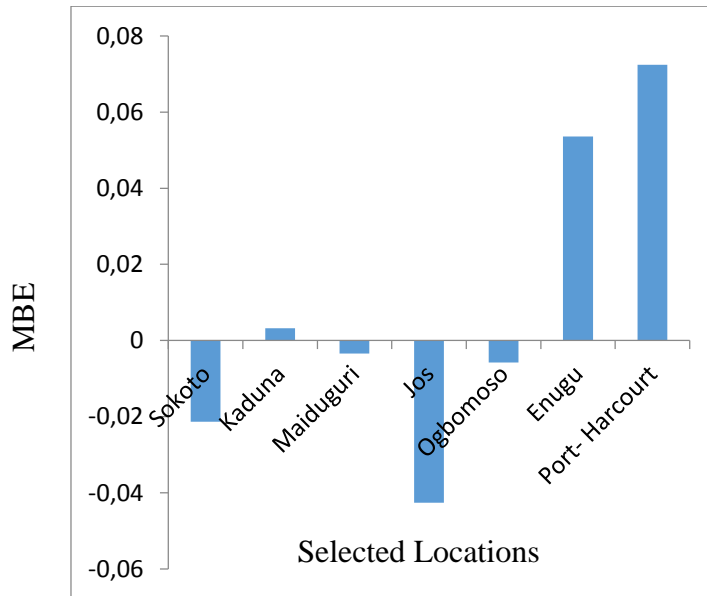


Figure 8 - MBE of the Selected Locations.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

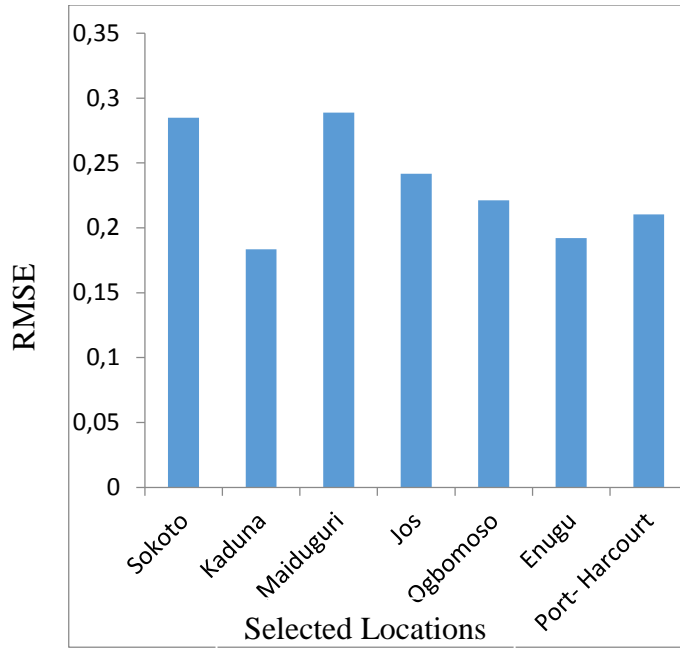


Figure 9 - RMSE of the Selected Locations.

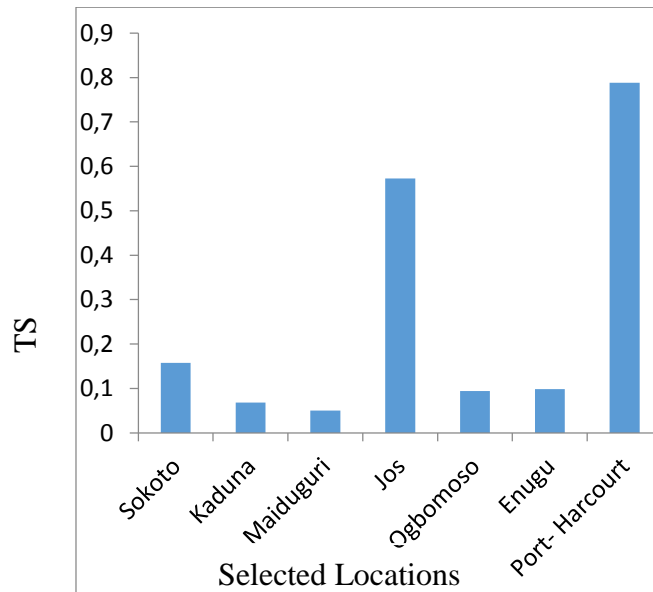


Figure 10 - TS of the Selected Locations.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

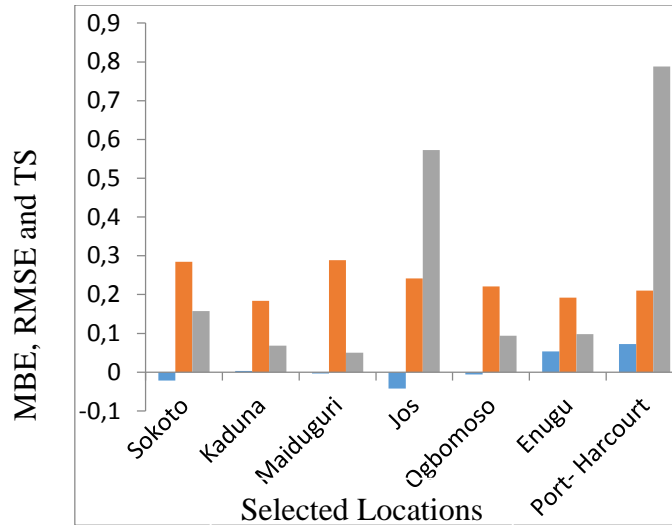


Figure 11 - MBE, RMSE and TS of the Selected Locations.

4. Conclusion

A Generalized two – parameter temperature based linear model for assessment of solar irradiance on Nigerian geo-political zones has been developed. The minimum and maximum monthly mean daily ambient temperatures as well as the monthly mean daily global solar radiation from NASA were collected and analyzed over a twenty years period for seven selected locations that cut across Nigerian geo-political zones. Appropriate mathematical notations were used to perform a stochastic analysis on the collected data to develop the modified model.

The results of the generalized model developed which indicates low value of MBE (0.0327) generalized suggested that it has a good long – term representation of the physical problems.

The RMSE is in the range of 0.1835 to 0.2887 indicating the efficiency of the generalized model. The global solar radiation intensity produced by the generalized model can be used in the design, analysis and performance estimation of the solar energy conversion system. This model can be applied to other locations not considered in this research paper. This model can replace the existing sunshine – based model. The estimation of the average daily global solar radiation which is necessary for optimal economic sizing of solar photovoltaic systems will encourage extensive use of solar energy, which is considered as essential solution to high atmospheric pollution caused from fossil fuel combustion.

References:

1. Akpabio LE, Udo SO, Etuk SE (2004) “Empirical correlations of global solar radiation with metrological data for Nigeria”, Turkish Journal of Physics, Volume 28, Number 3, p. 301-307.
2. Alam MS, Saha SK, Chowdhury MAK, Safuzzaman M, Rahman M (2005) “Simulation of solar radiation system”, Journal of Applied Sciences, Volume 2, Number 4, p. 751-758.
3. Almorox J, Benito M, Hontoria C (2005) “Estimation of monthly angstrom-prescott equation coefficients from measured daily data in Toledo, Spain”, Renewable Energy, Volume 30, Number 6, p. 931-936.
4. Alsalihi AM, Kadum MM, Mohammed AJ (2010) “Estimation of global solar radiation on horizontal surface using meterological measurement for different cities in Iraq”, Asian Journal of Scientific Research, Volume 3, Number 4, p. 240-248.
5. Angstrom AS (1924) “Solar and terrestrial radiation”, Metrological Society, Volume 50, p. 121-126.
6. Angustine C, Nnabuchi MN (2009) “Correlation between sunshine hours and global solar radiation in Warri, Nigeria”, Pacific Journal of Science and Technology, Volume 10, Number 2, p. 574-579.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHII (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

7. Badescu V (1999) "Correlations to estimate monthly mean daily solar global irradiation: application to Romania", *Energy*, Volume 24, Number 10, p.883-893.
8. Burari FW, Sambo AS (2001) "Model for the prediction of global solar radiation for Bauchi using metrological data", *Nigerian Journal of Renewable Energy*, Volume 91, p. 30-33.
9. Che HZ, Shi GY, Zhang XY, Zhao JO, Li Y (2007) "Analysis of sky conditions using 40 year records of solar radiation data in China", *Theoretical and Applied Climatology*, Volume 89, Number 1-2, p. 83-94.
10. Copper PI (1969) "The absorption of radiation in solar cells" *Solar Energy*, Volume 12, Number 3, p. 333-346.
11. Cristobal JRS (2011) "A multicriteria data development analysis model to evaluate efficiency of the renewable energy technologies", *Renewable Energy*, Volume 36, Number 10, p. 2742-2746.
12. Duffie JA, Beckman WA (2006) "Solar engineering of thermal processes", John Wiley & Son, New York, NY, USA, 3rd Edition. p. 93-125.
13. Falayi EO, Rabiun AB (2005) "Modeling global solar radiation using sunshine duration data", *Nigeria Journal of Physics*, Volume 17, p. 181-186.
14. Falayi EO, Adeniran JO, Rabiun AB (2008) "Empirical models for the correlation of global solar radiation with metrological data for Iseyin, Nigeria", *International Journal of Physical Sciences*, Volume 3, Number 9, p. 210-216.
15. Halouani N, Nguyen CT, Ngoc DV (1993) "Calculation of monthly average global solar radiation on horizontal surfaces using daily hours of bright sunshine", *Solar Energy*, Volume 50, Number 3, p. 247-258.
16. Kamman C (2001) "Impact of rising atmospheric CO₂ concentrations on the fluxes of the greenhouse gases N₂O and CH₄ in a grassland ecosystem", Thesis Giessen, Germany University of Giessen, p. 228-239
17. Kaplanis SN (2006) "New Methodologies to estimate the hourly global solar radiations comparisons with existing models", *Renewable Energy*, Volume 31, Number 6, p. 781-790.
18. Menges HO, Ertekin C, Sonmete MH (2006) "Evaluation of global solar radiation models for Konya, Turkey", *Energy Conversation and management*, Volume 47, Number 18, p. 3149-3173.
19. NASA (2010) "Surface metrological and solar energy data and information", Available: <http://eosweb.iarc.nasa.gov/sse> (Accessed: 10.04.2017).
20. NIMA (2011) "Archives of Nigerian meteorological agent (NIMA)", Oshodi, Lagos State, Nigeria. p. 131-152.
21. Obi C (2009) "Nigeria's Niger Delta: understanding the complex drivers of violent oil-related conflict", *Africa Development, Council for the Development of Social science Research in Africa, CODESRIA*, Volume 34, Number 2, p. 103-128.
22. Okogbue EC, Adedokun JA (2002) "On the estimation of solar radiation at Ondo, Nigeria", *Journal of Physics*, Volume 4, p. 97-99.
23. Okudamiy MS, Nzeako AN (2010) "Empirical model for estimating global solar radiation on horizontal surfaces for selected cities in the six geo-political zones in Nigeria", *Research Journal of Applied Science, Engineering and Technology*, Volume 2, Number 8, p. 805-812.
24. Okudamiy MS, Nzeako AN (2011) "Estimation of diffuse solar radiation for selected cities in Nigeria", *ISRN Renewable Energy*, Volume 2, Number 11, p. 439-460.
25. Page JK (1994) "The estimation of monthly mean values of daily total short-wave radiation on vertical and inclined surfaces from sunshine records for latitude 40^oN- 40^oS", In *Proceeding of the UN. Conference on New sources of Energy*, p. 178-198.
26. Parry ML, Canzian OF, Palutikos JP, Vander Linden PJ, Hanson CE (2007) "Climate change: impacts, adaptation and vulnerability", *Contribution of Working Group II to the Fourth Assessment Report of the IPCC*, Cambridge, United Kingdom and Network, USA, Cambridge University Press. p. 976-989.
27. Safari B, Gasore J (2009) "Estimation of global solar radiation on horizontal surface in Rwanda using empirical model", *Asian Journal of Science Research*, Volume 2, p. 68-75.
28. Sfetos A, Coonick AH (2000) "Univariate and multivariate forecasting of hourly solar radiation with artificial intelligent techniques", *Solar Energy*, Volume 68, p. 169-178.
29. Stone RJ (1993) "Improved statistical procedure for the evaluation of solar radiation estimation models", *Solar Energy*, Volume 51, Number 4, p. 289-291.
30. Trabea AA, Shaltout MAM (2000) "Correlation of global solar radiation with metrological parameters over Egypt", *Renewable Energy*, Volume 21, Number 2, p. 297-308.
31. Ulgen KS, Hepbasli A (2002) "Estimation of solar radiation parameters for IZMIR, Turkey", *International Journal of Energy Research*, Volume 26, Number 9, p. 807-823.
32. Ulgen KS, Hepbasli A (2002) "Prediction of solar radiation parameters through clearness index for IZMIR, Turkey", *Energy Sources*, Volume 24, Number 9, p. 773-785.



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 11.04.2017 <http://T-Science.org>

Ganiyu Adedayo Ajenikoko

Department of Electronic & Electrical Engineering,
Ladoke Akintola University of Technology,
P.M.B. 4000, Ogbomoso, Nigeria
ajeedollar@gmail.com

Williams Olagoke Agboibon

Department of Electronic & Electrical Engineering,
Ladoke Akintola University of Technology,
P.M.B. 4000, Ogbomoso, Nigeria

SECTION 6. Metallurgy and energy.

THE RISKS AND CHALLENGES AFFECTING THE IMPLEMENTATION OF NUCLEAR ENERGY FOR ELECTRICAL POWER GENERATION IN NIGERIA

Abstract: Nigeria as a country has a national power grid with an installed capacity of about 7000MW (Megawatts) of which about 4000MW is obtainable. This paper takes into consideration a method of power generation which apart from being a viable alternative for long-term energy production can also be operated with low costs. The process of large scale industrialization for any nation is fueled by its power sector. The latter is directly proportional to the former, thus meaning that any problems encountered in the power sector are transferred to the industrial sector of such a country. For a country with a population of about 180 million people, over 50000MW is needed to satisfy the industrial and domestic needs of the populace. With the operation of its three Hydro-Electric power stations and seven thermal power stations, all operating at a peak of about 5000MW (as recorded by the Transmission Company of Nigeria in the month of February 2016), it is necessary that other methods of electricity generation that are environmentally friendly and economically competitive be proposed and that the risks and challenges of the implementation of such methods be assessed in order to be able to facilitate the selection of a method of generation that can be implemented in order to fast-track the industrial evolution and to revitalize the Nigerian economy. The paper outlines the challenges that will be posed and faced by the Nigerian nuclear program which has been activated by the Nigerian Atomic Energy Commission.

Key words: Nuclear Power Plants, Nuclear Reactors, Electricity Generation, Nigerian Atomic Energy Commission, Environmental Impact, Nigerian Power Grid, Nigerian Nuclear Power Program.

Language: English

Citation: Ajenikoko GA, Agboibon WO (2017) THE RISKS AND CHALLENGES AFFECTING THE IMPLEMENTATION OF NUCLEAR ENERGY FOR ELECTRICAL POWER GENERATION IN NIGERIA. ISJ Theoretical & Applied Science, 04 (48): 49-56.

Soi: <http://s-o-i.org/1.1/TAS-04-48-8> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.8>

1. Introduction

Electricity is a necessity of life. A quarter of the entire world population currently live without electricity with about 95% of this group of people living in developing countries such as Nigeria. In an age where both industry and the economy are driven by electronic devices, access to electrical power is considered as a basic requirement to economic growth. With a population of about 180 million which makes it the seventh most populous in the world and an economy being regarded as the second largest in Africa, it is appalling to note that only about 40% of this number have access to electricity, with this privileged 40% having only epileptic power supply. With an installed grid capacity of 7000MW, less than 4000MW of electricity is generated

presently, which is even lower than what India generates from nuclear power plants alone [IAEA, 2009a; Yusuf 2016]. It is important to note this that total power generated currently is not even enough to satisfy the electrical needs of Lagos state which doubles as the economic center and the most populous state. This lack of adequate power supply has forced Nigerians to resort to the use of electricity generators which burn fossil fuels thus increasing the country's carbon footprint. With the drastic reduction in the price of crude oil worldwide, which is Nigeria's main source of revenue, more companies have closed up shop in Nigeria and moved to other African countries that have a steady power supply, while some are operating at less than optimal capacity. An example is the telecommunications



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

sector, where the intercontinental submarine cables that were laid for optimal data transfer are being underutilized due to operational costs of providing power to the transmission stations nationwide (Esogbue and Osaisai 2011). The problem of providing such a large amount of power as needed for the country is one that can be solved by the use of nuclear power. Nuclear reactors are one of the few alternative sources of electrical power that can be said to be long lasting, environmentally friendly and economically viable. With the advantage of being able to generate over 6000MW of electrical energy in one plant alone, nuclear power is the immediate solution to the power problem in Nigeria (Francis

2014). This necessity to develop nuclear power in Nigeria is what led to the creation of the Nigerian Atomic Energy Commission (NAEC) in August, 1976 and the launching of the Nigerian nuclear program. NAEC was dormant for thirty years until 2006 when it was activated by the same Head of State that had originally created it 30 years earlier (Emma 2011). NAEC's board was formally inaugurated in July 2006. It is a 10-man board with the President as its head [Osaisai 2011a; Osaisai 2011b]. Nuclear power only accounts for about 11% of the total world electricity generation even though, it being used to generate power for over fifty years as shown in Figure 1.

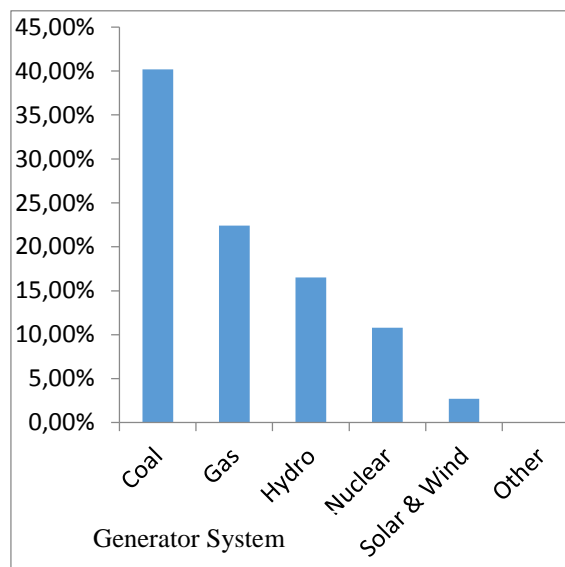


Figure 1 - World Electricity Production.

There are other safer and cleaner options like wind and solar, nuclear technology is still at a stage which makes the later option less practical on a large scale, especially in a developing country. Nuclear reactors can provide safe base-load power on a large scale while taking the dependence away from oil and gas. It also does not have the intermittency problem that plagues most of the frontline renewable energy technologies (NAEC 2011).

1.1 Nuclear Power

Nuclear power is the use of nuclear reactors that release nuclear energy to generate heat, which most frequently is then used in steam turbines to produce electricity in nuclear power plant. The term includes nuclear fission, nuclear decay and nuclear fusion. Presently, the nuclear fission of elements in the actinide series of the periodic table produces the vast majority of the nuclear energy in the direct service of humankind. Nuclear power stations use a fuel called uranium, a relatively common material. Energy is released from uranium when an atom is split by the

neutron. The uranium atom is split into two and as this happens, energy is released in the form of radiation and heat. This nuclear reaction is called the fission process. In the nuclear power station, the uranium is first formed into pellets and then into long rods. The uranium rods are kept cool by submerging them in water. When they are removed from the water, a nuclear reaction takes place causing heat. The amount of heat required is controlled by raising and lowering the rods. If more heat is required, the rods are raised further out of the water and if less is needed, they are lowered further into it.

1.2 Application of Nuclear Power

- The amount of electricity produced in a nuclear power station is equivalent to that produced by a fossil fuelled power station.
- Nuclear power stations do not burn fossil fuels to produce damaging, polluting gases.
- Many supporters of nuclear power production say that this type of power is environmentally friendly and clean. In a world that faces global

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

warming, they suggest that increasing the use of nuclear power is the only way of protecting the environment and preventing catastrophic climate change.

- Many developed countries such as the USA and the UK no longer want to rely on oil and gas imported from the Middle East, a politically unstable part of the world.

2. Nigerian Nuclear Roadmap

Since provisions have been made in the National Energy Policy [NAEC, 2011] to treat nuclear power as a viable means of electricity generation, steps have since been taken by the NAEC with a roadmap developed in its first year of operation. The nuclear road map is a three-phase technical frame work which involves the generation of 1, 200 Megawatts of electricity using nuclear power plant by 2025.

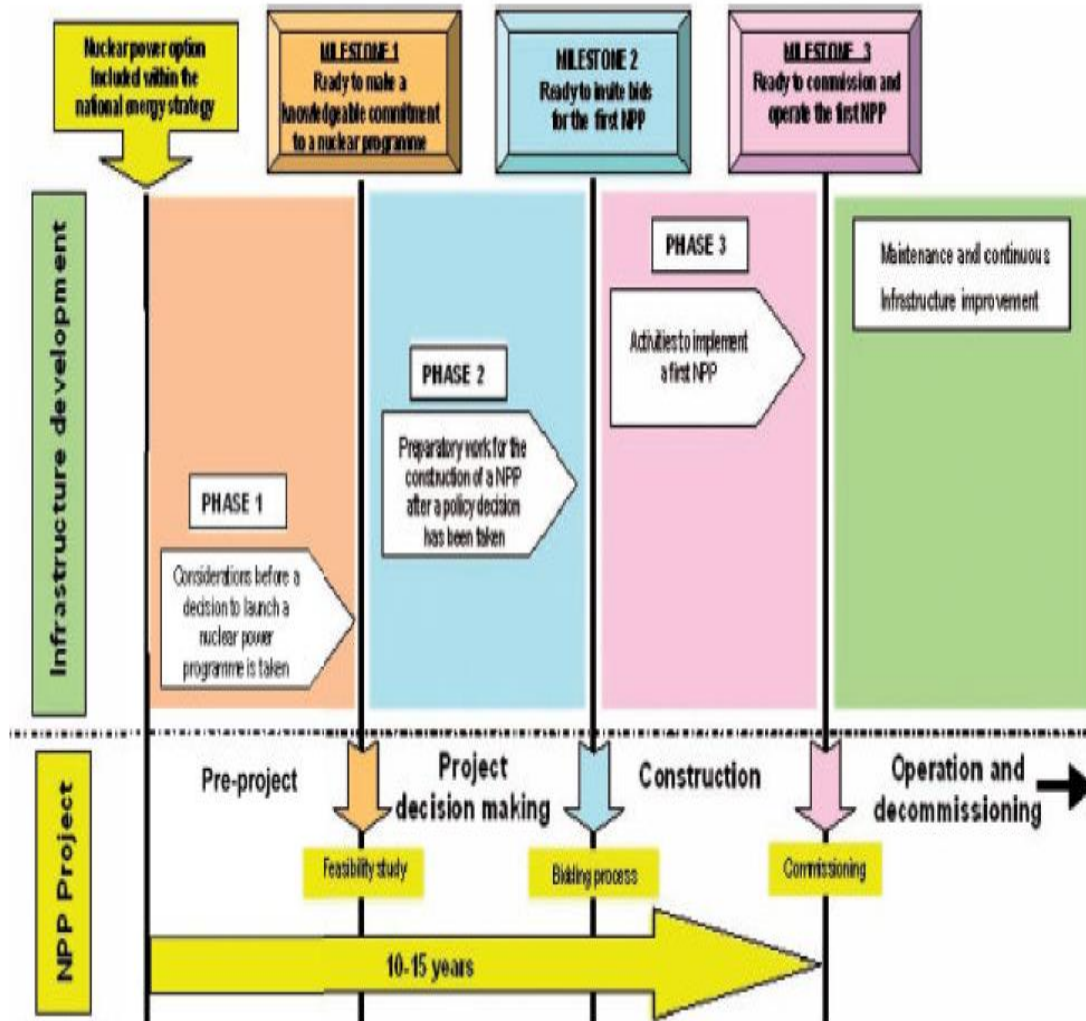


Figure2 - The Three Phases in the Development of a Nuclear Power Programme.

The capacity is to be increased to 4, 800MW by 2035. The three phases are (Simon 2015; Yehudab 2013):

1. Manpower and infrastructure development
2. Design certification, siting, regulatory and licensing approvals
3. Construction and start up.

The gestation period for the implementation of a nuclear power programme is at least 10 years. An

example is Iran where their first nuclear power plant was finally connected to the grid on September 4, 2011 and a ceremony to mark its commissioning was held on the 12th of September 2011. Meanwhile, work began on this plant since 1975 [Yusuf, 2016]. While it takes approximately 10 to 15 years to implement the infrastructural base [IAEA, 2009b], the Nigerian government has proposed 10 to 12 years to have on-line electricity generation from nuclear.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHIQ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

According to the IAEA Milestone Approach designed for the successful introduction of nuclear power, a country's nuclear programme is said to have attained Milestone 1 when phase 1 of the development of infrastructure is completed. Phase one which is also known as the pre-project phase is the period during which the country looks into what nuclear power entails. At the end of it, the country becomes ready to make commitment based on knowledge [IAEA, 2009b]. During phase 2, preparatory works such as developing the necessary infrastructures are put in place. At the end of this phase, Milestone 2 is said to have been reached. The country will now be ready to invite bids. Just as the United Arab Emirates that selected a bid at the end of 2009 from a consortium led by the Korea Electric

Power Corporation. Turkey cancelled its bidding process in the same year [IAEA, 2009a]. Milestone 3 is attained at the end of phase three. Phase three entails construction activities. When milestone three is reached, the country is then ready to commission and operate its nuclear power plant [IAEA, 2009b]. Nigeria's nuclear power programme is currently at the level of Milestone 2 as shown in Figure 2.

3.0 Execution of the Nigerian Nuclear Power Programme

In accordance to the roadmap outlined by the NAEC, a committee was set up for the survey, evaluation and selection of possible sites for a nuclear power plant (NPP). The criterion used for the evaluation of sites is outlined in figure 3 below.

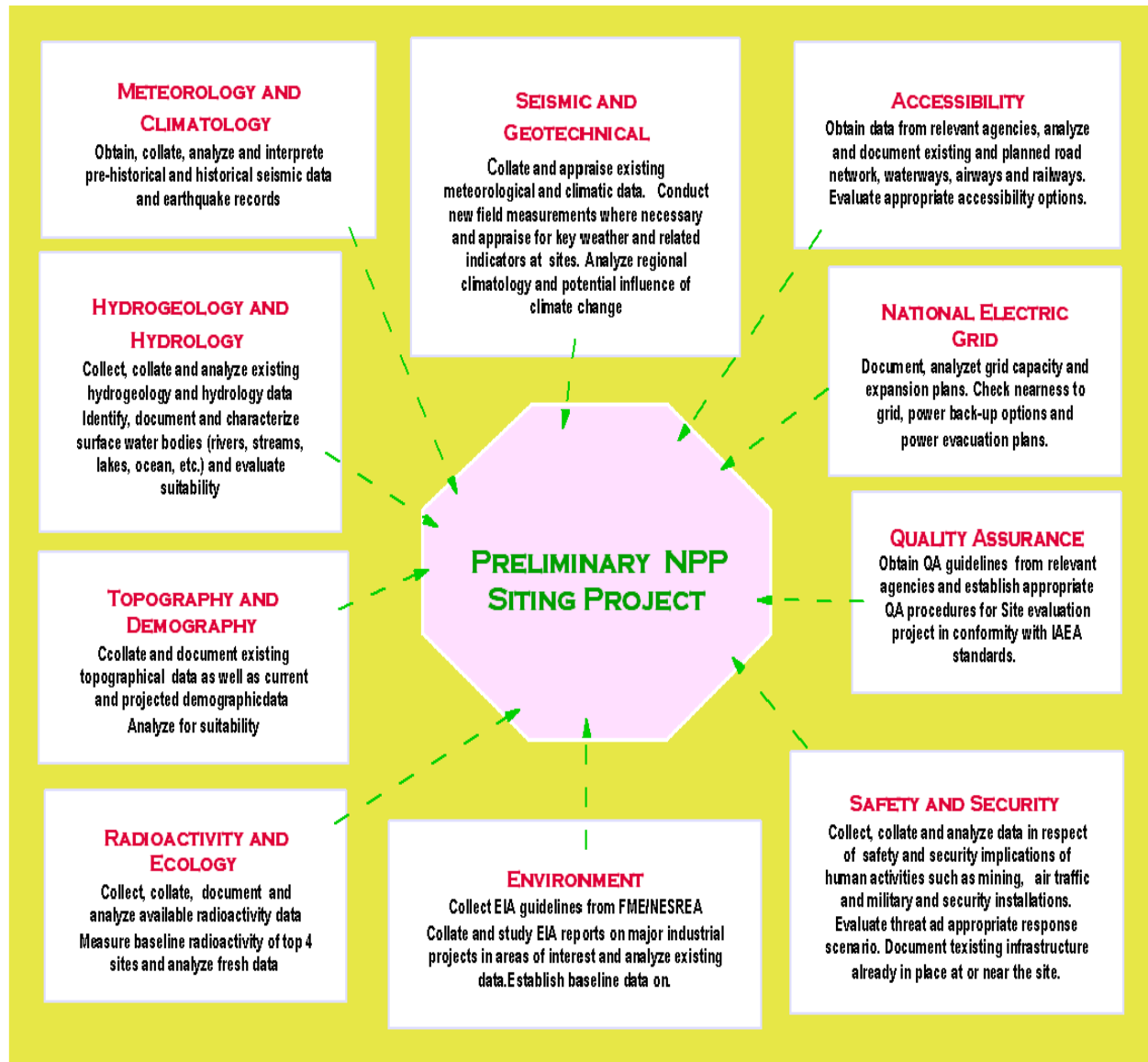


Figure 3 - Considerations in Preliminary Site Selection Activities.

Impact Factor:

ISRA (India)	= 1.344	SIS (USA)	= 0.912	ICV (Poland)	= 6.630
ISI (Dubai, UAE)	= 0.829	PIHIQ (Russia)	= 0.234	PIF (India)	= 1.940
GIF (Australia)	= 0.564	ESJI (KZ)	= 3.860	IBI (India)	= 4.260
JIF	= 1.500	SJIF (Morocco)	= 2.031		

Using the above criteria, four sites were then selected:

1. Geregu/Ajaokuta in Kogi State,
2. Lau Local Government Area in Taraba State,
3. Itu in Akwa Ibom State and
4. Agbaje in Okitipupa Local Government Area in Ondo State.

These sites were then submitted to the Nigerian government with two being finally selected as sites for NPPs having a combined capacity of 4, 800MW. The two sites selected are Itu in Akwa Ibom state and Geregu in Kogi state as shown in Figure 4.



Figure 4 - Map of Nigeria with Selected States Highlighted in Red.

Both sites were announced at a plenary session of the phase 2 Integrated Nuclear Infrastructure Review (INIR) in June 2015 with an establishment of the target of 1, 200MW by 2025 and 4, 800MW by 2035. Preliminary licensing of each site by the NNRA is expected by the end of 2016. These nuclear plants will be constructed by Russia's Rosatom Corporation, with financing been handled by both the Nigerian government and Rosatom. The selection of

these sites, further development of a National Nuclear Insurance Policy and Scheme in order to adequately address the civil liability of component for the nuclear power industry in conformity with the 1963 Vienna Convention on Civil Liability for Nuclear Damage all point towards the progress made by the Nigerian government towards the achievement of its nuclear policy. The outline of the Nigerian Nuclear programme is shown in Figure 5.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

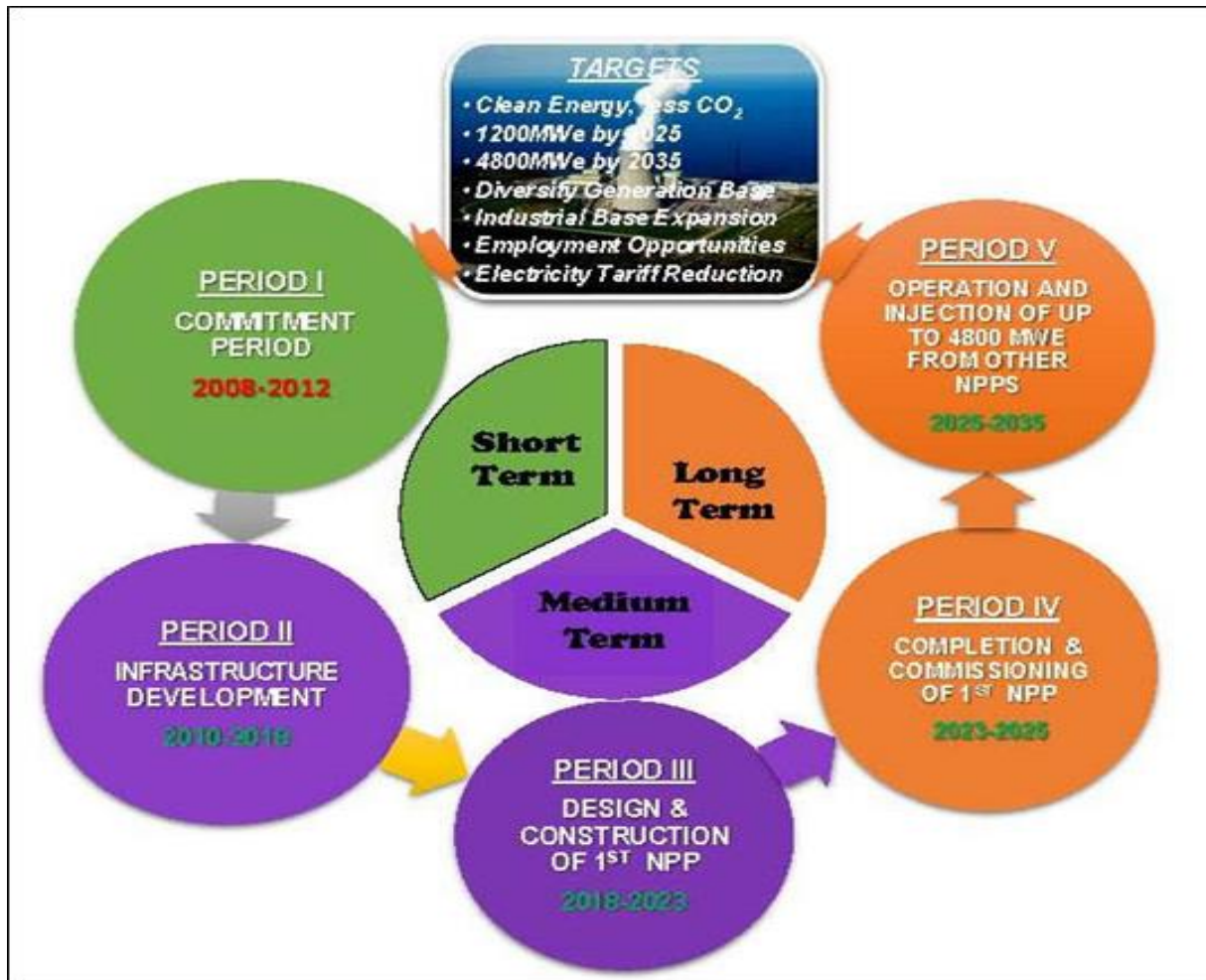


Figure 5 - Outline of the Nigerian Nuclear Programme.

Nigeria has made a number of international agreements with various countries in order to facilitate a smooth execution of its nuclear programme, speed up international nuclear cooperation and develop its nuclear capacity. These include:

1. Nigeria signed a Memorandum of Cooperation with Iran in 2008,
2. Two international agreements to assist in the development of nuclear technology and exploitation of uranium resources were signed with Russia in 2009 [Emma, 2011].
3. Co-operation agreements were also signed with India and South Korea in 2009.
4. Nigeria was one of the first countries to sign and ratify the 1968 Nuclear Non-Proliferation treaty (NPT).
5. A Comprehensive Safeguards Agreement and Additional Protocol with the IAEA, allowing the agency access to a nation's facilities to ensure that peaceful nuclear technology and materials are not

diverted to weapon development has been concluded [IAEA, 2009b].

A number of documents have also been signed but not yet ratified. These include:

1. The 1997 Joint Convention on Safety of Fuel Management and Safety of Radioactive Waste Management,
2. The Convention on the Physical Protection of Nuclear Materials and
3. The 1963 Vienna Convention on Civil liability for Nuclear Damage.

4. Risks and Challenges of the Nigerian Nuclear Programme

One of the issues the Nigeria nuclear programme is currently facing and that might prove to be a bigger stumbling block on the road to electricity generation by nuclear power is the public reaction to the programme. Even with less than half of the Nigerian populace being aware of the fact that the country has gotten to phase two of the nuclear programme, it is apparent that over half of that

Impact Factor:

ISRA (India)	= 1.344	SIS (USA)	= 0.912	ICV (Poland)	= 6.630
ISI (Dubai, UAE)	= 0.829	PIHHI (Russia)	= 0.234	PIF (India)	= 1.940
GIF (Australia)	= 0.564	ESJI (KZ)	= 3.860	IBI (India)	= 4.260
JIF	= 1.500	SJIF (Morocco)	= 2.031		

number are against the continuation of the programme. State leaders in Akwa Ibom, which is one of the two locations selected for the citing of an NPP have rejected the siting plans. Their actions were attributed to the disasters caused by reactors failures in other countries, the perennial incompetence often associated with matters of safety and security in Nigeria and the population density of the state which is about 706 people per kilometer with a total land area of 7, 081km square.

Other issues raised include the incompetency of the NEMA and the inexperience of the Rosatom Corporation.

Another challenge that affect the construction of a NPP in Nigeria include the current state of insecurity in the nation, with Boko Haram terrorists raging in the north and Niger Delta militants in the parts of the south-south and south-east of the nation. This has led to questioning of the ability of the government to adequately secure the NPPs after construction.

The process of assigning projects to different parts of Nigeria due to geo-political zoning also raises questions on whether these sites were actually selected on the merit of their topography and ease of evacuation in case of emergency or were just selected by political ideologies. The ability of the National Emergency Management Agency (NEMA) is also called into question. Having failed to properly manage other minor disasters in the past, their ability to properly handle the evacuation and rehabilitation process in case of a nuclear meltdown is doubted.

Another issue is the Nigeria corruption pandemic which has often hampered the development of all major projects embarked on by the federal government for ages. The cutting of corners by contractors and politicians alike in order to achieve personal gain will be to the detriment of a successful nuclear program where even small mistakes in construction might lead to major disasters.

The disposal of radioactive waste, especially high level wastes (HLW) and intermediate level wastes (ILW) is another issue that has been shrouded in uncertainty and that might cause delays in the nuclear programme. The understanding of the impact of the ILW/ HLW management on public acceptance of nuclear technology is something that has not been made apparent by the government and the NAEC. This can be said to be apparent in the mismanagement of the toxic waste dumping case at Koko, Delta state in 1988, when an Italian company shipped in 1, 079, 000 metric tonnes of toxic waste. After the residents of the town resisted the plans to relocate them elsewhere so as to avoid the long-term effects, the toxic waste might have on them, the plans to build a laboratory in order to monitor the effects of

the radioactivity on their health all collapsed. This brings to the fore the question of a proper management of nuclear waste that will be generated come 2025 when the first nuclear plant will be connected to the national power grid.

5. Conclusion

The success of any project whether big or small is ensured by the endorsement of the people who will be affected either directly or indirectly by its siting, construction and usage. This is very true for a project as massive as the nuclear power programme being embarked upon by the Nigerian government. Especially in view of the fact that nuclear power is the only environment friendly and economically viable project that can provide the Nigerian populace with a much needed stable power supply. Nigeria needs to produce enough power in order to be able to sustain her waning economy and attract back foreign investors who have all abandoned the country due to the high costs of alternative sources of power and thus exponentially increase her industry. It is thus advisable that so as not to have a public outcry of such a magnitude that can throw a wrench in the nuclear programme, the NAEC and other agencies involved should embark on a nationwide sensitization of the public of the readiness and preparedness of the nation to embark on the programme. This is to be achieved by making the general public aware of the environmental and economic benefits of nuclear power compared to others, safety and security issues inherent in deploying nuclear power for power generation, and the various ways it intends to manage the risks involved and the waste produced. Poland, for example had its nuclear programme revived after being stopped when both the government and public opinion changed. Chile is also carrying its general public along as they consider the nuclear power option, with the Minister of Energy laying much emphasis on public information. Series of public seminars on nuclear power were also conducted with opinion leaders and the general public in attendance. Also, it is important to note that the IAEA has the authority to approve, regulate and monitor civil nuclear uses worldwide and that the agency will never have approved the Nigeria nuclear programme if there were discrepancies or inadequacies in the country's ability to successfully construct and operate a nuclear power plant. More legislation that will serve as a check to corrupt practices in the nuclear programme should also be made so as to prevent the perversion of the project. The security of the nuclear power plants should also be made a top priority to the Nigerian security agencies in order to prevent the attacks on the reactors by criminal deterrents. Residents of the localities in which the

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PИИИ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

plants are to be sited should also be sensitized periodically of the evacuation plans in case of a meltdown so as to prevent loss of lives. The educational, financial and industrial sectors should

also be engaged so as to take advantage of the project and the opportunities that will create by the implementation of the project.

References:

1. Emma A (2011) "24 Years After the Drums of Death: A New Air in Koko", Available: www.vanguardngr.com/2011/07/24-years-after-the-drums-of-death-a-new-air-in-koko/, (Accessed: July 31, 2011).
2. Esogbue AO, Osaisai FE (2011) "Networking of National Universities for the Implementation of a Graduate Program in Nuclear Science and Engineering: The Advantages and Challenges", Paper Presented at the National Workshop/Expert Mission on Education and Training for the Implementation of the Nuclear Energy Programme in Nigeria. December 13 – 14, 2011. Abuja, Nigeria.
3. Francis I (2014) "An Overview of Nigeria's Nuclear Energy Programme in the INPRO Methodology area of Infrastructure", Centre for Energy Research and Development, Obafemi Awolowo University, Ile-Ife. Nigeria, 8th INPRO Dialogue Forum, Vienna, 26-29 August, 2014.
4. IAEA (2009) "Status and Trend of Nuclear Technologies", Report of the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO) IAEA-TECDOC-1622, 2009a.
5. IAEA (2009) "Initiating Nuclear Power Programmes: Responsibilities and Capabilities of Owners and Operators", IAEA Nuclear Energy Series, No. NG-T-3.1, 2009b.
6. NAEC (2011) Website. Available: <http://www.nigatom.org.ng> (Accessed: 10.04.2017).
7. Osaisai FE (2011) "Nuclear Power Introduction in Nigeria: Organization and Way Forward", Paper presented at the Second Regional Conference on Energy and Nuclear Power in Africa, Cape Town, South Africa, 2011a.
8. Osaisai FE (2011) "Status and Plans for NPP Infrastructure Development in Nigeria", Paper Presented at the National Workshop/Expert Mission on Human Resources Development for Nigeria's Nuclear Power Programme; Strategies for Implementation, Abuja, Nigeria, 2011b.
9. Simon Echewofun Sunday (2015) "FG picks Gereg, Itu as 2, 400MW nuclear power sites", Available: www.dailytrust.com.ng/daily/index.php/business/57411-fg-picks-gereg-itu-as-2-400mw-nuclear-power-sites (Accessed: June 17, 2015).
10. Yehuwdah EC, Bamidele F Ebiwonjumi (2013) "Nigeria's Nuclear Power Generation Project: Current State and Future Prospects", Journal of Energy Technologies and Policy, www.iiste.org, Vol.3, No.7, p.63-75.
11. Yusuf OA (2016) "Radioactive waste Disposal: Hindrance to Nigeria's Civil Nuclear programme", Available: www.opinion.premiumtimesng.com/2016/05/23/172942/ (Accessed: 10.04.2017).



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 14.04.2017 <http://T-Science.org>

Afshar Naimeh

Graduated master of TEFL,
Scientific Research University of Guilan
naimafshar@gmail.com

SECTION 24. Sociological research.

COMPUTER-ASSISTED LANGUAGE LEARNING: THE EFFECT OF CALL ON IRANIAN EFL LEARNERS WRITING PERFORMANCE

Abstract: It should be borne in mind that CALL does not refer to the use of a computer by a teacher to type out a worksheet or a class list or preparing his/her own teaching alone. The field of computer-assisted language learning (CALL) is, by the very nature of its dependence on technology, one that is in a constant state of change. Given the centrality of technology in CALL, any discussions of theory, research or practice must take into the consideration the impact that technology has, not only on the learning process, but also on the reasons for and the focus of research undertaken in the field, and the range of factors which may contribute to how and why technology is employed in a given context. The purpose of this study was to investigate attitudes toward computer-assisted language learning among 60 Iranian secondary school students. The methodology employed a replication design and questionnaire approach. T-test analysis of variance procedures were used to evaluate relationships among the independent variables and the attitude survey responses. Findings indicated that Iranian college students hold positive attitudes toward learning English, using computers, and using computers when learning English. Moreover, male Iranian college students held more favorable attitudes than females toward the use of computers when learning English.

Key words: computer, attitudes, computer-assisted language learning, technology.

Language: English

Citation: Naimeh A (2017) COMPUTER-ASSISTED LANGUAGE LEARNING: THE EFFECT OF CALL ON IRANIAN EFL LEARNERS WRITING PERFORMANCE. ISJ Theoretical & Applied Science, 04 (48): 57-63.

Soi: <http://s-o-i.org/1.1/TAS-04-48-9> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.9>

Introduction

During the past few years, computer-assisted language learning software (CALL) has gained an ever more prominent role in foreign language instruction. With an increasing amount of software available in the market, language teachers need to be able to identify good software, which is suitable for their students. The best way to identify the most suitable software is to undertake software evaluation both to compare software and to identify useful features. The expression 'computer-assisted language learning' (CALL) refers to a variety of technology uses for language learning including CD-ROMs containing interactive multimedia and other language exercises, electronic reference materials such as online dictionaries and grammar checkers, and electronic communication in the target language through email, blogs, and wikis. These varied technologies used by language learners have spread over the past several years across many language

classrooms and beyond. The main aim of CALL is to find ways for using computers for the purpose of teaching and learning the language. CALL is variously known as Computer-Aided Language Learning (CALL), Computer-Assisted Language Instruction (CALI) and Computer-Enhanced Language Learning (CELL). The first two terms generally refer to computer applications in language learning and teaching, while CELL implies using CALL in a self-access environment (Hoven, 1999).

Review of the Related Literature

Computers in Language Acquisition

Despite its brief history, computer-assisted language learning (CALL) has been informed by a wide variety of theories, and that variety appears to be growing. In the first section of this chapter, we describe the concept of theory in this field and discuss its role in illuminating what happens when



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

humans interact with materials and one another through the mediation of digital devices, programs, networks and tools in the pursuit of language learning objectives. In the late 1970s and early 1980s, language teachers with access to the new desktop 'microcomputers' and an urge to tinker began creating their own simple programs to support their students' learning. In time, a critical mass of these language teachers and their institutional support staff would converge at language teaching conferences and create an embryonic field, widely, though not universally, known as computer-assisted language learning (CALL). It was based on a behavioristic learning pattern and as such was regarded as little more than a mechanical tutor that never grew tired. It was primarily programmed for explicit grammar instruction, extensive drills, and translation tests (Ahmad, Corbett, Rogers, & Sussex, 1985). Learning English as a second language is a great challenge for students from a non-English speaking background. It is not the natural language acquisition seen in first language learning. Learners have to depend on various learning resources to ensure success. These resources include interacting with native English speakers, effective teaching methods, appropriate technology and the ability of the learners to manage their learning. Computer technology has permeated society in general and education in particular. While computer technology has created an impact in education, the debate on its role in teaching and learning has not settled comfortably. The abbreviation CALL stands for Computer Assisted Language Learning. It is a term used by teachers and students to describe the use of computers as part of a language course. (Hardisty & Windeatt: 1989). It is traditionally described as a means of 'presenting, reinforcing and testing' particular language items. The learner is first presented with a rule and some examples, and then answers a series of questions which test her/his knowledge of the rule and the computer gives appropriate feedback and awards a mark, which may be stored for later inspection for the teacher. According to Pusack and Otto (1997), one type of CALL is multimedia which can be very valuable to students during the process of language acquisition. Through multimedia simulations, students have the chance to join in activities as if they are in the target culture (Pusack & Otto); they may become effective participants in a situation and play a role in its outcome. These programs have been shown to be very effective because learners think that they are actually using their language skills to complete something, rather than simply practicing grammatical features (Chiquito, Messkill, & Renjilian- Burgy, 1997).

Anxiety in Computer-Assisted Language Learning

Previous studies have also suggested that one of the benefits of computer-mediated interaction is the potential to reduce learners' anxiety levels (Chun, 1994; Kelm, 1992; Kern, 1995; Sullivan & Pratt, 1996; Warschauer, 1996; Abrams, 2003). As Beauvois (1992) points out, the reduced sense of immediacy in SCMC, when compared to F2F, provides learners with additional time to process input and produce output. This added time is typically going to be beneficial to some learners with greater levels of anxiety or for learners with lower proficiency levels. In addition, Kern (1995) found that introverted learners may be more likely to participate in SCMC contexts, with students reporting that they felt 'freer' to take part in the interaction. According to Beauvois (1997), computer-mediated contexts provide 'an anonymous, less pressured environment that tends to lower the affective filter' (p.171), potentially providing anxious or introverted students with additional interactional opportunities. Furthermore, due to the additional processing and planning time in computer-mediated interaction, which provides learners with opportunities to reflect on what was said before responding (Beauvois, 1992), SCMC interaction, particularly text-based modalities, may place lower social demands on learners, thereby reducing their levels of anxiety (Baralt & Gurzynski-Weiss, 2011). For some students, this type of classroom environment might lead to not only reduced learner opportunities, but also negative effects on learner motivation (Yang et al., 2012).

Attitudes and CALL

Baker (1992) outlined the importance of attitudes as a fundamental variable because of its close connection to a person's construct system and its value as an indicator of public opinions and viewpoints. Just as positive attitudes toward restoration of health are important, similarly positive attitudinal orientation toward a language (Mian, 1998) and CALL (Min, 1998) is also important. A positive and healthy attitude feeds into the language's restoration and preservation while negative and unhealthy attitudes cause decay and death of the language. Language consensus provides us with a measure on the health of the language; it reveals possibilities, problems, improvements, and changes in first, second, and/or foreign languages.

Statement of the Problem

The teaching context often determines the role of CALL. In an English as a Second Language (ESL) environment, the communicative CALL program often supplements and augments the classroom activities by providing games for practice or word

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHII (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

processing for composition (Nutta, 1996). Introduction of new pedagogical tools does not reject, but includes programs and methods of the previous phase, representing inevitable innovation that gains acceptance slowly and unevenly. Multimedia computing, the Internet, and the World Wide Web have provided an incredible boost to Computer Assisted Language Learning (CALL) applications, offering a wide variety of educational, programs, resources, software, journals, organizations, software tutorials including all types of exercises for grammar drills, vocabulary, listening and pronunciation exercises, games, etc. After giving a general picture of CALL development, this article focuses on exploitation of the language resources and learning materials that are accessible on CD-ROMs and on the Internet, presents two CALL projects, and reports experiences in partner universities. In terms of theoretical approach, practice, computer and communication technology, CALL represents a challenge for the teacher and for students as a new medium of exploration.

Significance of the Study

Learning English as a second language is a great challenge for students from a non-English background. It is not the natural language acquisition seen in first language learning. Learners have to depend on various learning resources to ensure success. These resources include interacting with native English speakers, effective teaching methods, appropriate technology and the ability of the learners to manage their learning. This is an interventionist approach to literacy education. The role of computers in second language teaching is now being discussed by foreign language teachers, educators and psychologists. Computers have been considered as tools, teachers by themselves or threats, depending on the different approaches to the matter. The essence of CALL is to determine how technology may play a role in the teaching and learning of a second language. How exactly technology may be used to achieve this will depend very heavily on what technologies are used, as this will necessarily have an effect on when, where and how the technology can be applied to the language learning context. As the use of CALL grew over time, a variety of second language acquisition theories came to inform pedagogical practice and innovation as well as research on the effectiveness and outcomes of technology mediated practice and communication. In a CALL context, the application of distributed cognition is immediately obvious. For instance, if we look at the process of learning vocabulary, it is evident that there are several ways in which the learning process may be somewhat different than learning through non-technological means. Learners

may be able to input the vocabulary that they wish to learn into software that can automatically create questions for them, be they in context or using other tools.

Research Questions

In the interdisciplinary field of Instructional Technology (IT) and Second Language Acquisition (SLA), numerous studies have been conducted to examine the following two issues:

RQ: Does CALL have any positive effect on Iranian EFL learners writing performance or not?

Methodology

This study was conducted using *an experimental research* design and was comprised of two experiments. The independent variable was the method of grammar instruction, i.e., the traditional classroom teacher-directed grammar instruction and the CALL grammar instruction. The dependent variables were scores on three separate criterion-referenced measures of passive grammatical forms. In addition, one of the features of the *Azar Interactive* online program is that it records the number of hours learners spent using the program. Also, to address experimental mortality, it was determined that students who spent less than two hours on the practice exercises and activities on the *Azar Interactive* online courseware would be excluded from the data analysis processes.

Participants

The participants of the present study consisted of 45 intermediate EFL learners aged within the range of 21 to 24 years. The sample was comprised of male learners at the intermediate level of English language proficiency studying at Islamic Azad University of Tabriz in Iran. In the present study, the sample selection was done in a larger sample of 60 intermediate EFL learners were selected randomly and a piloted language proficiency test, OPT Test was administered to them. Following the administration of OPT, 46 intermediate EFL learners whose scores fell within the range of one standard deviation above and below the sample mean were chosen as the participants to take part in this study.

Instrument

In order to compare the effect of treatment on students' writing performance, two IELTS writing tasks were adapted from samples of IELTS writing tests (pre-intermediate) as pre- posttest. Moreover, due to the level of the students, the researcher selected the descriptive essay writing. The test was

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PJHJ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

submitted to a panel of five experts who were instructors in the English language and another panel of 10 individuals who majored in English education. The majority of these individuals possessed academic credentials at the level of a master's degree or above. The instrument had a Cronbach alpha of .91 for overall attitude measurement. The students were asked to write about the following topics: "Describe a memorable trip you took ", as a pre-test. And for a posttest, "Describe the first time you met one of your friends". To achieve the purpose of the study in controlled and guided writing classes, the students practiced Jack c. Richards and Chuck

Sandy's (1998) book titled *Passages –pre-intermediate*. The most emphasized parts of the book for the class were the grammar, discussion, and writing sections.

Findings & Results

The research question was "Does CALL have any positive effect on Iranian EFL learners writing performance or not?" Table (1) shows the descriptive analysis for the pretest and posttest of general English in the experimental group of the study:

Table 1

Descriptive results of the experimental group of the study.

	N	Mean	Std. Deviation	Std. Error Mean
Pre-test	23	15.2343	1.52120	0.40024
Post-test	23	17.6011	1.02150	0.34773

As it is indicated in table (1) the number of participants has been 23 in each experiment (N=23). There has been no missing value which shows all selected students took part in the experiments of the study. The mean for the pretest scores of general English exam in the experimental group was shown to be 15.2343, as compared to the mean for posttest scores in the same group which was 17.6011. As for the standard deviations obtained for the experimental group, there seems to be more variability among the

pretest scores than the posttest. This confirms that group work learning led to better achievement and was effective in better learning. This may demonstrate the participant's posttest scores are more homogenous after conducting the treatment of the study. The same descriptive analysis has been done for the pretest and posttest of general English in the control group of the study. As you can see in table (2) below:

Table 2

Descriptive results of the control group of the study.

	N	Mean	Std. Deviation	Std. Error Mean
Pre-test Cont	23	15.0333	1.09807	0.2415
Post-test Cont	23	15.0542	1.07425	0.1961

Table (2) shows that the number of participants has been 23 in each experiment (N=23), and there has been no missing value. The mean for the pretest scores of general English in control group was shown to be 15.0333 as compared to the mean for the

posttest scores of the same group which was shown to be 15.0542. As for the standard deviation obtained for the control group, there seems to be more variability among the pretest scores in the post test.

Table3

Independent Samples T-test results of the study t-test for Equality of Means.

	Levene's Test for Equality of Variance		T-Test for Equality of Mean						
	F	Sig.	T	df	Sig.(2-tailed)	Mean Difference	Std. Error Difference	95% Confidence interval of the Difference	
								Lower	Upper
Writing Equal									

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

Variances comprehension assumed	0.000	0.756	0.079	58	0.0093	0.5556	.69923	-1.36545	1.47657
Equal Variances not assumed					0.0093	0.5556	.69923	-1.36555	1.47666

Table (3) shows that the observe T-value of the study was calculated as to be (3, 2) and the degree of freedom was (58). The level of significance was

calculated as to be 0.000. In each group of the study, the results have been illustrated in the table (4).

Table 4

Paired Sample results of the study.

	Observed T	Critical T	df	Sig. (2-tailed)
Pre-test Ex- Post-test Exp	3.541	4.045	33	0.089
Pre-test Cont Post-test Cont	0.817	2.045	29	0.042

According to table (4), the covariance between the two sets of pretest and posttest scores in the experimental group is 3.541 while it is 0.817 in the control group of the study. The critical T in two groups is different. The hypothesis of the study which aimed the effect of CALL devices on Iranian EFL learners' writing performance was rejected. Because observe T is less than the critical T. And the level of significant is 0.05.

Discussion

Information and communication technologies have never been more interesting due in large part to their intimate integration into everyday life. The role of computers in second language teaching is now being discussed by foreign language teachers, educators and psychologists. Computers have been considered as tools, teachers by themselves or threats, depending on the different approaches to the matter. Two different groups of criticism were formed at the beginning: on the one hand, those who thought that computers would usher language learners and teachers into a new era and that all learning problems could be solved by using computers in the classroom; on the other hand, those led by Ludite prejudices, worried about their jobs and always afraid of machines who thought, and still think, that computers are not only useless but dangerous from all points of view. As the use of CALL grew over time, a variety of second language acquisition theories came to inform pedagogical practice and innovation as well as research on the effectiveness and outcomes of technology mediated practice and communication. However, it is also the case that many CALL specialists have exhibited the understandable tendency to become focused on the technology while perhaps attending less assiduously to emerging trends and current findings in second language acquisition, and more broadly, from research on human development. However, the

attitudes of learners toward CALL could play an important role in language acquisition. Unfortunately, researchers and scholars within Iran lack important information in this area. For this reason, a research study which investigates learners' attitudes toward CALL in Taiwan may provide an empirical base for future studies on EFL learners' attitudes toward CALL. Evaluation of CALL in relation to SLA is addressed in this part of the essay. It is a fact that teachers and students use computers for many different purposes and in many different ways. Therefore, language teachers and researchers need to have a clear idea of what kinds of CALL tasks promote and are beneficial for SLA. It is also true that software developers not always have a clear idea of what is needed in terms of successfully enhancing SLA. That is why an important degree of responsibility relies on teachers and their ability to determine some criteria for what can be considered effective CALL. According to Chapelle (2001), three aspects must be taken into consideration: findings and theory-based speculation about ideal conditions for SLA, a theory of articulation needs to be articulated, and criteria and theory need to apply to software and the task learners will carry out. More than a checklist to evaluate CALL, teachers and administrators need to establish solid criteria for CALL task appropriateness. Chapelle (2001) establishes some basic principles. These elements are language learning potential, learner fit, meaning focus, authenticity, positive impact, and practicality. These are important ideas on the evaluation of CALL in relation to SLA.

Conclusion

The role of computers in language teaching has changed significantly in the last three decades. Previously, computers used in language teaching were limited to text. Simple simulations and exercises, primarily gap-filling and multiple-choice

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

drills, abounded. Technological and pedagogical developments now allow us to integrate computer technology into the language learning process. Multimedia programs incorporating speech-recognition software can immerse students into rich environments for language practice. Since the computer is capable of playing so many different roles in and out of class, it is believed to be the most exciting and potentially useful aid so far available to

language teachers and learners. By the way, the computer is a mechanical device which can be used well or badly. Without careful choice and preparation of materials, careful lesson planning and classroom management, and training of both learners and teachers, the computer is useless. Therefore, the teacher plays a significant role in implementing the computer into the lesson plan.

References:

- Allum P (2002) CALL in the classroom: The case for comparative research. *ReCALL* 14.1, 146-166.
- Anderson J (1991) Computer-based technologies: effective tools for teaching and learning. In T. Lê and M. McCausland (Eds.), *Language education: Interaction and development. Proceedings of the International Conference on Language Education: Interaction and Development*. University of Tasmania.
- Blackie D (1999) What use in the internet for classroom teachers? *English Teaching Professional*, p.18.
- Brumfit C (eds.) (1985) *Computers in English language teaching*. Exeter: A. Wheaton & Co. Ltd.
- Chapelle C (1990) The discourse of computer-assisted language learning: toward a context for descriptive research. *TESOL Quarterly*, 24(2):199-225.
- Crystal D (1987) *The cambridge encyclopedia of language*. New York: CUP.
- Duber J (2000) *Computer assisted language learning*. [www-writing.Berkeley.edu/chorus/call/September 2001](http://www-writing.Berkeley.edu/chorus/call/September%202001).
- Dhaif HA (1989) Can computers teach languages? *English teaching forum*.27(3),pp.17-19.
- Ditto W (2000) Hardware (computer), *Microsoft Encarta Encyclopedia 2000*. 1993-1999 Microsoft Corporation.
- Eastman D (2001) Search engines, web, directories and sites for news and current affairs. *ELT Journal*. 55/1, p 102-06: OUP
- Hammersmith L (1998) Easy internet activities for the ESL teacher. University of Illinois at Chicago. www.eslplanet.com.
- Hardisty D, Windeatt S (1989) *CALL*. Oxford: Oxford University Press.
- Higgins J (1988) *Language, learners and computers*. Longman Group UK Limited. (1995). *Computers and english language learning*. London: Intellect Ltd.
- Ittelson JC (2000) Computers. *Microsoft encarta encyclopedia 2000*. 1993-1999 Microsoft Corporation.
- Mirescu S (1997) Computer assisted instruction in language teaching. *English teaching forum* 37, 2, p. 29.
- Hinkel E (2005) Introduction. In E. Hinkel (Ed.), *Handbook of research in second language teaching and learning* (pp. 3-6).
- Mahwah NJ, Lawrence Erlbaum Associates, Hubbard P (2005) A review of subject characteristics in CALL research. *Computer Assisted Language Learning*, 18(5), 351-368.
- Hubbard P (2008) Twenty-five years of theory in the CALICO Journal. *CALICO Journal*, 25(3), 387-399.
- Hubbard P, Bradin-Siskin C (2004) Another look at tutorial CALL. *ReCALL*, 16(2), 448-461.
- Hutchins E (1995). *Cognition in the wild*. Cambridge, MA: MIT Press. 1995a.
- Hutchins E (1995) How a cockpit remembers its speeds. *Cognitive Science*, 19, 265-288. 1995b.
- Levy M (1997) *Computer-assisted language learning: Context and conceptualization*. Oxford: Oxford University Press.
- Levy M (2000) Scope, goals and methods in CALL research: Questions of coherence and autonomy. *ReCALL*, 12(2), 170-195.
- Levy M, Stockwell G (2006) *CALL dimensions: Options and issues in computer assisted language learning*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Mackey A, Gass S (2012) Introduction. In A. Mackey & S. Gass (Eds), *Research methods in second language acquisition: A practical guide* (pp. 1-4). Chichester: Wiley-Blackwell.
- Mitchell R, Myles F, Marsden E (2013) *Second language learning theories* (3rd ed.). Abingdon: Routledge.



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

27. Sannino A, Daniels H, Gutiérrez C (Eds.) (2009) *Learning and expanding with activity theory*. New York: Cambridge University Press.
28. Sawchuk P, Duarte N, Elhammoumi M (Eds.) (2006) *Critical perspectives on activity: Explorations across education, work, & everyday life*. New York: Cambridge.
29. Schegloff EA, Koshik I, Jacoby S, Olsher D (2002) Conversation analysis and applied linguistics. *Annual Review of Applied Linguistics*, 22, 3-31.
30. Schleppegrell M (2004) *The language of schooling: A functional linguistic perspective*. Mahwah, NJ: Lawrence Erlbaum Associates.
31. Skehan P (2003) Focus on form, tasks and technology. *Computer Assisted Language Learning*, 16, 391-411.
32. Smith B (2003) Computer-mediated negotiated interaction: An expanded model. *Modern Language Journal*, 87, 38-58.
33. Stivers T, Enfield NJ, Brown P, Englert C, Hayashi M, Heinemann T, Hoymann G, Rossano F, De Ruiter JP, Yoon KE, Levinson SC (2009) Universals and cultural variation in turn taking in conversation. *Proceedings of the National Academy of Sciences of the United States of America*, 106(26), 10587-10592.
34. Thorne SL (2008) Mediating technologies and second language learning. In Leu D, Coiro J, Lankshear C, Knobel M (Eds.), *Handbook of Research on New Literacies* (pp. 417-449). Mahwah, NJ: Lawrence Erlbaum.
35. Thorne SL, Black RW, Sykes J (2009) Second language use, socialization, and learning in internet interest communities and online games. *Modern Language Journal*, 93, 802-821.
36. Thorne SL, Reinhardt J (2008) "Bridging activities," new media literacies, and advanced foreign language proficiency. *CALICO Journal*, 25, 558-572.
37. Ware P, Kramsch C (2005) Toward an intercultural stance: Teaching German and English through tele collaboration. *Modern Language Journal*, 89, 190-205.
38. Warschauer M, Healey D (1998) Computers and language learning: An overview. *Language Teaching*, 31: 57-71.
39. Wenger E (1998) *Communities of practice: Learning, meaning, and identity*. Cambridge: Cambridge University Press.



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHII (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 14.04.2017 <http://T-Science.org>

Grittel Gennadievna Shevchenko
Assistant
KubSTU

Dmirtriy Andreevich Gura
Candidate of Technical Sciences, Senior Lecturer
KubSTU

Ivan Dmitrievich Muranov
Bachelor, Student
KubSTU

ivanmuranov595@gmail.com

Elizaveta Nikolaevna Bahtarova
Bachelor, Student
KubSTU

SECTION 8. Architecture and construction.

PROVIDING HIGH-PRECISION MEASUREMENTS BY ELECTRONIC TACHEOMETERS

Abstract: Different topographic and geodesic works in all engineering spheres of activities require compliance with different requirements for the accuracy of measurements. High-precision works include determining deposits of a construction, creation of planned high-rise grounding, creation of government geodesic networks and supplementing construction of complex objects (bridges, multi-story buildings and skyscrapers). These works require linear submillimeter and angular sub-second accuracy. It is necessary to know all possible ways of providing precise measurements and then effectively put them to practice. We must also choose appropriate geodesic equipment for conducting high-precision measurements on the area. Moreover, it is essential to identify all external factors which affect the quality of measurements and be able to exclude them.

Key words: geodesy, tacheometer, angular measurements, TOPCON.

Language: Russian

Citation: Shevchenko GG, Gura DA, Muranov ID, Bahtarova EN (2017) PROVIDING HIGH-PRECISION MEASUREMENTS BY ELECTRONIC TACHEOMETERS. ISJ Theoretical & Applied Science, 04 (48): 64-69.

Soi: <http://s-o-i.org/1.1/TAS-04-48-10> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.10>

ОБЕСПЕЧЕНИЕ ВЫСОКОТОЧНЫХ ИЗМЕРЕНИЙ ЭЛЕКТРОННЫМИ ТАХЕОМЕТРАМИ

Аннотация: Различные топографо-геодезические работы во всех сферах инженерной деятельности требуют соответствия различным требованиям к точности линейно-угловых измерений. Такие высокоточные работы, как определение осадок сооружений, создание плано-высотного обоснования, создание фрагментов государственных геодезических сетей (ГГС), сопровождение строительства ответственных и сложных объектов (мосты, путепроводы, многоэтажные дома и небоскребы), требуют линейную субмиллиметровую и угловую субсекундную точность. Необходимо знать всевозможные способы обеспечения высокоточных измерений и уметь выполнять их. Также, необходимо уметь выбирать геодезическое оборудование для проведения высокоточных измерений на местности. Помимо всего этого, в обязательном порядке следует знать и выявлять все внешние факторы, влияющие на качество измерений, а также, уметь их исключать.

Ключевые слова: геодезия, тахеометр, угловые измерения, TOPCON

Введение

Причины погрешностей

Существуют разнообразные причины погрешностей в линейно-угловых измерениях. Самые значительные из них кроются в инструментальных и методических ошибках:

- Отсутствие тщательных установок перед началом работы (приведение прибора в рабочее состояние (горизонтирование и центрирование

над пунктом или точкой хода), обеспечение незыблемости штатива).

- Недостаточное количество избыточных измерений, некачественное наведение на предметы

- Невыполнение различных контрольных измерений.

- Выбор неудовлетворяющих пунктов в качестве исходных.



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	РИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

Также, существуют и другие различные причины потери точности в измерениях: ошибки человеческого фактора и влияние окружающей среды, которые тоже необходимо устранять. [9]

Способы и пути повышения точности:

1. Исключение инструментальных ошибок

Перед работой необходимо тщательно выбирать и подбирать используемое геодезическое оборудование. Штатив должен быть устойчивым, ножки его не должны прогибаться, концы ножек должны быть заострены, а становой винт не иметь люфта. Трегерная подставка должна гладко ездить при центрировании, а центрир с цилиндрическим и круглым уровнем должны быть хорошо отъюстированы. Оборудование должно быть высокоточным, таким как Topcon OS-101L или Topcon OS-103L.

В.Л. Ассур излагал следующие погрешности угломерных приборов, которые применимы в настоящее время к современным электронным тахеометрам:

1) Параллакс сетки нитей. Параллакс может давать довольно значительную погрешность. Полностью его устранить невозможно, но следует стремиться к его отсутствию. Для этого глаз наблюдателя должен находиться на продолжении визирной оси.

2) Биссектор сетки нитей. Биссектор должен находиться в коллимационной плоскости. Его следует периодически юстировать, но также, как и параллакс сетки нитей, полностью отъюстировать его не удастся. Для устранения ошибки, наводиться на предметы местности следует одной и той же точкой биссектора, близкой к центру поля зрения трубы.

3) Наведение. Наведение на цель наводящими винтами может производиться ввинчиванием («от себя») и вывинчиванием («на себя») винта наводящего устройства. Следует наводиться на цель исключительно ввинчиванием винта наводящего устройства. [8]

2. Исключение методических ошибок

Во-первых, для обеспечения точности, необходимо делать достаточное количество избыточных измерений, которые уменьшат погрешность в каждом отсчете. Например, при измерении расстояния дальномером, следует брать на один, а пять-шесть отсчетов и брать в обработку среднее значение.

Необходимо выполнять всевозможные контрольные измерения. Например, при проложении хода, следует брать отсчеты при двух кругах – КЛ и КП. Из двух кругов находить коллимационную ошибку: $C = (КЛ - КП \pm 180^\circ) \times$

2, она не должна превышать двойной точности тахеометра. Для Topcon OS-101L эта величина составляет $2''$, а для Topcon OS-103L – $6''$.

На каждой точке необходимо замыкаться на начальную цель. Значение замыкания должно стремиться к нулю. [10]

3. Погрешности, вызванные влиянием внешней среды.

Очень важную роль в качестве и точности измерений играет влияние внешней среды.

1) Во-первых, внешняя среда напрямую влияет на качество изображения. Условия видимости зависят от прозрачности атмосферы. В приземных слоях атмосферы всегда присутствует дымка, состоящая из мельчайших частиц пыли, дыма и водяных паров. Это влияет, также, и на контрастность изображения. При коэффициенте видимости 0,82 условия видимости считаются удовлетворительными. А при коэффициенте 0,92 условия видимости считаются хорошими, а дальность видимости достигает 40-50 км.

2) Во-вторых, приземленные слои атмосферы из-за различной температуры, давления и влажности имеют различную плотность. Световой луч, обычно, претерпевает различные преломления. Это явление называется рефракцией. При наихудших условиях, рефракция может давать погрешность до $10''$.

Чтобы исключить влияние рефракции, необходимо:

- Поверхности сырых низменностей и озер пересекать направлениями симметрично, а реки и долины – под прямым углом.

- Вблизи визирного луча не должно лежать никаких предметов, так как любой предмет может нагреваться быстрее, чем воздух, значит и воздух около предмета будет нагреваться быстрее и иметь меньшую плотность.

3) Изменение температуры тахеометра. Особенно наибольшую погрешность дает неравномерное нагревание отдельных его частей. Это ведет к нарушению геометрической схемы, положенной в основу конструкции инструмента, отъюстированную при поверках. [8]

4. Наиболее выгодное время для проведения линейно-угловых измерений

Наиболее выгодным для наблюдений считается время, когда влияние рефракции минимальное, изображение спокойное, видимость и контрастность наблюдаемых целей удовлетворительная. По многолетним наблюдениям выявлено, что это время начинается утром (через полчаса после восхода) до 8-9 часов утра. А также, вечерние часы: начиная с 16 часов и заканчивая за полчаса до захода солнца. Это обуславливается ежедневным

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	ПИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

равномерным нагреванием и остыванием воздуха, которое влияет практически на все факторы стабильности работы прибора. [8]

Выбор используемого оборудования

Тахеометры подразделяются на 3 типа: инженерные, технические и роботизированные

(рис. 1-4). Когда разговор идет о точности, то подразумеваются роботизированные и инженерные тахеометры. Сравнительная характеристика наиболее точных на данный момент тахеометров представлена в таблице 1. Образцами таких тахеометров являются следующие модели:



Рисунок 1 - Topcon OS-101L.



Рисунок 2 - Topcon DS-101

Impact Factor:

ISRA (India)	= 1.344	SIS (USA)	= 0.912	ICV (Poland)	= 6.630
ISI (Dubai, UAE)	= 0.829	ПИИИ (Russia)	= 0.234	PIF (India)	= 1.940
GIF (Australia)	= 0.564	ESJI (KZ)	= 3.860	IBI (India)	= 4.260
JIF	= 1.500	SJIF (Morocco)	= 2.031		



Рисунок 3 - Topcon IS-301.



Рисунок 4 - Topcon PS-101.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	ПИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

Таблица 1

Сравнительная характеристика тахеометров Topcon

	OS-101L	DS-101	IS-301	PS-101
Класс прибора	Инженерный	Роботизированный	Роботизированный	Роботизированный
СКО измерения угла	1''	1''	1''	1''
Дальность взятия отсчета по дальномеру в б/о	0.3-500 м	0-1000 м	5-2000 м	0,3 – 1000 м
Дальность взятия отсчета по дальномеру на пленку	0.3-500 м	0-1000 м	5-2000 м	0,3 – 1000 м
Дальность взятия отсчета по дальномеру на призму	0.3-5000 м	0-6000 м	5-3000 м	0,3 – 6000 м
Точность измерения расстояний в б/о	$3 + 2 \times 10^{-6} \times D$ мм	$2 + 2 \times 10^{-6} \times D$ мм	10 мм + 10 ppm	2 мм + 2 ppm
Точность измерения расстояний на призму	$2 + 2 \times 10^{-6} \times D$ мм	$1,5 + 2 \times 10^{-6} \times D$ мм	2 мм + 2 ppm	1,5 мм + 2 ppm
Увеличение зрительной трубы	30x	30x	30x	30x
Пыле-влагозащищенность	IP65	IP65	IP54	IP65
Рабочая температура, °C	-30...+50	-20...+50	-20...+50	-20...+50
Точность оптического центра, мм	<0.5	<0.5	<0.5	<0.5
Внутренняя память	500 Мб	500 Мб + съемная до 8 Gb	1 Gb	500 Мб + съемная до 8 Gb
Период работы при +20°C	20 часов	5 часов	3.5 часа	4 часа
Вес, кг	5,7	6,1	6,2	6,9

Из таблицы можно сделать вывод, что модели имеют высокую точность измерения расстояний, при этом модель инженерного тахеометра OS-101L имеет меньшую, по сравнению с другими моделями, дальность взятия отчета без отражателя и на пленку. [11]

Заключение

Таким образом, накапливается очень много факторов, влияющих на потерю точности в линейно угловых измерениях. Также, усугубляет ситуацию то, что все современные приборы

построены на электронике, и невозможно проследить за каждым его вычислением. Но следуя всем указаниям, мы исключим все возможности потери точности в измерениях. После рассмотренного выше, напрашивается вывод, что при высокоточных измерениях необходимо делать всевозможные избыточные измерения, различные контроли, исключать все влияющие факторы природного характера. Также, необходимо грамотно выбирать используемое оборудование. И таким образом, обработчик получит грамотные измерения для обработки.

References:

- Gura TA, Ereshko PS (2016) Trebovanija k tochnosti vypolnenija geodezicheskikh izmerenij pri opredelenii osadok zdaniij. V sbornike:

EVROPEJSKIE
ISSLEDOVANIIJA
Mezhdunarodnoj

NAUChNYE
sbornik statej
nauchno-prakticheskoy



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHII (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

- konferencii. pod obshhej redakciej G.Ju. Guljaeva. 2016. p. 190-194.
- Gura TA, Bobuh DN (2016) Sravnitel'naja harakteristika jelektronnyh taheometrov Sokkia, Nikon i Topcon // V sbornike: INTERNATIONAL INNOVATION RESEARCH sbornik statej pobeditelej V Mezhdunarodnoj nauchno-prakticheskoj konferencii. Penza, 2016. p. 170-175.
 - Shevchenko AA, Krivcov JA (2016) TREBOVANIIa K PROVEDENIJu ISSLEDOVANIJ JeLEKTRONNYH TAHEOMETROV V USLOVIJaH OTSUTSTVIJa SPECIAL"NOJ LABORATORII // V sbornike: EVROPEJSKIE NAUCHNYE ISSLEDOVANIIa sbornik statej Mezhdunarodnoj nauchno-prakticheskoj konferencii. pod obshhej redakciej G.Ju. Guljaeva. 2016. p. 200-203.
 - Zheltko CN, Gura DA, Pastuhov MA, Shevchenko GG (2016) Ob issledovanijah uglomernyh pogreshnostej jelektronnyh taheometrov // Monografija. Krasnodar, 2016, 143 p.
 - (1976) GOST 22268-76. Geodezija, terminy i opredelenija.
 - (1988) GOST 23543-88. Pribory geodezicheskie. Obshhie tehničeskie uslovija.
 - (2001) GOST R 51774-2001. Taheometry jelektronnye. Obshhie tehničeskie uslovija.
 - Assur VL, et al. (1979) «Vysshaja geodezija», Nedra, Moscow.
 - Kuroshev GD, Smirnov LE (2008) «Geodezija i topografija», IC «Akademija», Moscow.
 - Glinskij SP, et al. (1995) «Geodezija», «Kartgeocentr» - «Geoizdat», Moscow.
 - (2016) Katalog geodezicheskih priborov ZAO «GSI», Sankt-Peterburg.
 - (2016) Katalog geodezicheskih priborov ZAO «Geodezicheskie pribory», Sankt-Peterburg.
 - (2017) Ofical'nyj web-sajt Topcon Corporation Available: <https://www.topconpositioning.com/> (Accessed: 10.04.2017).
 - (2017) Ofical'nyj kanal v seti internet proekta California Land Surveyors Association, USA
 - Gura DA (2016) Razrabotka metodov issledovanija jelektronnyh taheometrov v uslovijah proizvodstva dlja ocenki i povyshenija tochnosti izmerenija gorizonta'nyh uglov / avtoreferat dissertacii na soiskanie uchenoj stepeni kandidata tehničeskih nauk po special'nosti 25.00.32 Geodezija / Moskovskij gosudarstvennyj universitet geodezii i kartografii. Moscow, 2016. – 24p.
 - Pastuhov MA, Denisenko VV, Gura DA, Shevchenko GG (2016) Opredelenie pogreshnosti geodezicheskih priborov za nepravil'nost' formy capf i bokovoe gnutie zritel'noj trubny // Nauchnye trudy Kubanskogo gosudarstvennogo tehnologičeskogo universiteta. 2016. № 11. p. 155-171

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHII (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 30.04.2017 <http://T-Science.org>

SECTION 9. Chemistry and chemical technology.

Igor Viktorovich Goloperov

Candidate of chemical sciences, Docent,
Department of Occupational Health and Environmental
Safety,
Ukrainian Engineering and Pedagogical Academy,
Ukraine
goloperov_igor_viktorovich@ukr.net

Elena Aleksandrovna Belova

Candidate of chemical sciences, Docent,
Department of Occupational Health and Environmental
Safety,
Ukrainian Engineering and Pedagogical Academy,
Ukraine
belovaalena@meta.ua

Aleksandr Nikolaevich Baklanov

Doctor of chemical sciences, Professor,
Head of the Department of Occupational Health and
Environmental Safety,
Ukrainian Engineering and Pedagogical Academy,
Ukraine
baklanov227@mail.ru

Larisa Vladimirovna Baklanova

Candidate of chemical sciences, Docent,
Head of the Department of Occupational Health and
Environmental Safety,
Ukrainian Engineering and Pedagogical Academy,
Ukraine
baklanovalarisa@yandex.ua

SOLVING THE PROBLEMS OF SAFETY IN THE PRODUCTION OF IODIED SALT

Abstract: A solution to the problem of the safety of iodized salt is proposed. A new safe method of salt iodization has been developed. Toxic potassium iodate is suggested to be replaced with safer sodium iodide. To prevent the oxidation of sodium iodide with air oxygen, the technology of its introduction into the food emulsifier of MGD has been proposed. Sodium iodide was dissolved in ethanol by ultrasound to obtain 50-55% solution. In the resulting solution, the food emulsifier MHD was dissolved to 50-60% solution. The resulting iodine-containing additive was mixed with common salt. Shelf life of iodized salt is 2 years.

Key words: Safe iodized salt, sodium iodide, food emulsifier MGD.

Language: Russian

Citation: Goloperov IV, Belova EA, Baklanov AN, Baklanova LV (2017) SOLVING THE PROBLEMS OF SAFETY IN THE PRODUCTION OF IODIED SALT. ISJ Theoretical & Applied Science, 04 (48): 70-75.

Soi: <http://s-o-i.org/1.1/TAS-04-48-11> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.11>

РЕШЕНИЕ ПРОБЛЕМ БЕЗОПАСНОСТИ ПРИ ПРОИЗВОДСТВЕ ЙОДИРОВАННОЙ ПОВАРЕННОЙ СОЛИ

Аннотация: Предложено решение проблемы безопасности йодированной соли. Разработан новый безопасный способ йодирования соли. Токсичный йодат калия предложено заменить на безопасный йодид натрия. Для предотвращения окисления йодида натрия кислородом воздуха предложена технология его введения в пищевой эмульгатор МГД. Йодид натрия под действием ультразвука растворяли в этаноле для получения 50-55 % раствора. В полученном растворе растворяли пищевой эмульгатор МГД до 50-60% раствора. Полученную йодсодержащую добавку смешивали с поваренной солью. Срок хранения йодированной соли 2 года.

Ключевые слова: Безопасная йодированная соль, йодид натрия, пищевой эмульгатор «МГД».



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	РИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

Введение.

Для профилактики йодного дефицита наиболее эффективным считается использование йодированной поваренной соли [1].

На Украине производство йодированной поваренной соли в промышленных масштабах осуществляется согласно ГОСТ 13830-97 (ДСТУ 3583-97) Соль поваренная пищевая. Общие технические условия введением йодата калия в количестве (40±15) г/т [1]. Недостатком такой соли является токсичность йодата калия [2, 3]. При превышении допустимых концентраций йодат калия ухудшает состояние зрения, вплоть до отслоения сетчатки глаза [2]. Токсичность йодата калия требует крайне равномерного его распределения в пачке соли. Однако, последнее невозможно, так как вследствие микрокапиллярного эффектов йодат калия мигрируют из центра пачки соли к ее краям (30-50% йодата калия в зависимости от влаги соли и содержания примесей в течение трех месяцев) [4]. Готовый продукт – йодированная соль по ГОСТ 13830-97 имеет гарантированный срок хранения- 12 месяцев [1]. Однако, это соблюдается только при йодировании вакуум-выварочной поваренной соли, в остальных видах поваренной соли (каменной, садовой и самосадочной) наличие примесей - восстановителей, приводит к восстановлению йодат-иона до йода и как результат – к потерям йода в течение 6-8 месяцев [4]. Следует также отметить, что йодат калия является сильным окислителем и в смеси с некоторыми органическими веществами способен образовывать взрывчатые смеси, что требует особых условий его хранения [5].

Нами ранее было предложено для получения безопасной йодсодержащей добавки применять смесь 40% спиртового раствора йодида натрия с расплавом пищевого эмульгатора – «Моноглицериды дистиллированные» (МГД). Пищевой эмульгатор МГД широко применяется при производстве маргарина и относится к пищевым продуктам и не требует специального разрешения на применение в качестве пищевой добавки. При йодировании поваренной соли такой йодсодержащей добавкой, ее вводили в подогретую до температуры 70 - 83 °С поваренную соль с последующим перемешиванием. Однако, срок хранения такой соли не превышал 8 месяцев. Кроме того, технологический процесс приготовления такой соли был очень сложным из-за необходимости использования расплава пищевого эмульгатора МГД. Также, необходимо было использовать значительное количество эмульгатора МГД, не менее 2,5 г/кг поваренной соли [6].

Данная работа посвящена получению безопасной йодированной поваренной соли с длительным сроком хранения. При этом в качестве основного йодсодержащего вещества использовали йодид натрия. Следует также отметить, что йодид натрия входит в перечень веществ, которые разрешается вводить в поваренную соли (перечень приведен в дополнении № 2 к межгосударственному стандарту ГОСТ 13830 -97«Соль поваренная. Общие технические условия).

Экспериментальная часть

При выполнении данной работы использовали ультразвуковой генератор типа 24-УЗГИ-К-1,2 к которому подключали магнитострикционные и пьезоэлектрические излучатели, позволяющие создавать в исследуемых растворах ультразвуковые колебания частотой от 18 кГц до 2,5 МГц. Применяли стандартные пьезоэлектрические излучатели типа ЦТС-19, изготовленные из цирконата титана-свинца с защитным покрытием из фторопласта [7-9]. Данные пьезоэлектрические излучатели были выбраны потому, что имеют достаточную механическую прочность и стабильность излучения на высоких частотах УЗ (от 100 кГц до 2,5 МГц) при интенсивности до 12 Вт/см² [7-9]. Кроме того, использовали ультразвуковой диспергатор УЗДН - 1М с набором магнитострикционных излучателей, что позволяло создавать в исследуемой системе ультразвуковые колебания частотой от 16 кГц до 100 кГц при интенсивности ультразвука до 25 Вт/см². Также использовали типовую методику получения и исследования йодированной поваренной соли, предложенную ВНИИГалургии (Россия) [4].

Опыты проводили следующим образом. Предварительно готовили йодсодержащую добавку. Для этого растворяли йодид натрия в этаноле под действием УЗ частотой 18 – 160 кГц, интенсивностью 0,05-0,45 Вт/см² в течение 10-50 с. При этом получали 40-55% раствор йодида натрия в этаноле. В полученном растворе йодида натрия в этаноле растворяли эмульгатор МГД под действием УЗ частотой 19-46 кГц, интенсивностью 0,05-0,40 Вт/см² и УЗ частотой 0,5-3,0 МГц интенсивностью 0,45-0,76 Вт/см² в течение 0,1-3,6 мин. Соответствующее количество приготовленной таким образом йодсодержащей добавки (содержание йодида натрия должен быть 20-44 мг/кг пробы поваренной соли, а эмульгатора МГД 1,00-2,50 г/кг пробы поваренной соли) смешивали с подогретой до температуры 70-83 °С 1 кг



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	ПИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

поваренной соли. Каждую пробу полученной таким образом поваренной соли разделяли на две части. Одну часть вносили в эксикатор для проведения испытаний на слеживаемость эксикаторным методом [4], вторую - помещали в стандартную упаковку и через 9, 12, 18 и 24 месяца определяли содержание йода по стандартной методике [1].

Результаты и их обсуждение

В результате опытов установлено следующее. Растворения йодида натрия в этаноле под действием ультразвука частотой 100-150 кГц, интенсивностью 0,15-0,25 Вт/см² позволяет

увеличить растворимость йодида натрия в этаноле с 40% до 55% (табл.1 - табл.3). Следует также отметить, необходимость использования йодида натрия, вместо йодида калия, связана с тем, что последний значительно лучше растворяется в этаноле[7, 10].

Использование одновременного действия ультразвука частотой 20-45 кГц, интенсивностью 0,10-0,35 Вт/см² и ультразвука частотой 1,0-2,5 МГц, интенсивностью 0,50-0,75 Вт/см² в течение 0,5-3,0 мин позволяет проводить растворение эмульгатора МГД в 45 - 55% спиртовом растворе йодида натрия (табл.4 - табл.7).

Таблица 1

Влияние частоты УЗ на растворимость йодида натрия в этаноле
Интенсивность УЗ – 0,20 Вт/см². Время воздействия УЗ – 30 с.

Характеристики	Частота УЗ, кГц									
	Без УЗ	18	98	100	120	130	140	150	155	160
Растворимость йодида натрия в этаноле, г/100 мл	40	40	42	50	52	53	55	55	45	42

Таблица 2

Влияние интенсивности УЗ на растворимость йодида натрия в этаноле
Частота УЗ – 120 кГц. Время воздействия УЗ – 30 с.

Характеристики	Интенсивность УЗ, Вт/см ²									
	Без УЗ	0,05	0,10	0,15	0,20	0,25	0,30	0,35	0,40	0,45
Растворимость йодида натрия в этаноле, г/100 мл	40	40	42	53	55	56	56	55	44	42

Таблица 3

Влияние времени воздействия УЗ на растворимость йодида натрия в этаноле
Частота УЗ – 120 кГц. Интенсивность УЗ – 0,20 Вт/см².

Характеристики	Час дії УЗ, с									
	Без УЗ	10	15	20	25	30	35	40	45	50
Растворимость йодида натрия в этаноле, г/100 мл	40	40	45	55	55	56	56	56	56	55

Таблица 4

Влияние частоты высокочастотного УЗ на растворимость пищевого эмульгатора МГД в спиртовом растворе йодида натрия.

Частота УЗ, МГц	растворимость эмульгатора МГД, г/100 мл, в спиртовом растворе йодида натрия, %			
	40 %	45 %	50 %	55 %
0,5	17	24	26	31
1,0	22	56	58	59
1,5	23	57	58	60
2,0	22	56	60	62
2,5	23	54	57	62

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	РИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

3,0	12	31	36	38
С УЗ только низкой частоты	0	0	0	0

Частота низкочастотного УЗ 22,0 кГц. Интенсивность низкочастотного УЗ – 0,20 Вт/см², интенсивность высокочастотного УЗ – 0,60 Вт/см². Время воздействия УЗ – 1 мин.

Таблица 5

Влияние частоты низкочастотного УЗ на растворимость пищевого эмульгатора МГД в спиртовом растворе йодида натрия.

Частота УЗ, кГц	растворимость эмульгатора МГД, г/100 мл, в спиртовом растворе йодида натрия, %			
	40 %	45 %	50 %	55 %
19	11	22	23	24
20	22	54	56	57
22	22	56	58	59
30	21	55	57	60
45	22	56	58	61
46	14	31	33	35
С УЗ только высокой частоты	0	0	0	0

Частота высокочастотного УЗ 1,0 МГц. Интенсивность низкочастотного УЗ – 0,20 Вт/см², интенсивность высокочастотного УЗ – 0,60 Вт/см². Время воздействия УЗ – 1 мин.

Таблица 6

Влияние интенсивности УЗ на растворимость пищевого эмульгатора МГД в спиртовом растворе йодида натрия.

Интенсивность низкочастотного УЗ, Вт/см ²	Интенсивность УЗ высокой частоты, Вт/см ²					
	0,45	0,50	0,60	0,40	0,75	0,76
0,05	24	28	26	27	23	22
0,10	33	56	57	57	56	30
0,20	32	57	58	59	58	30
0,35	31	57	60	60	59	34
0,40	30	32	32	34	33	31

Частота низкочастотного УЗ – 22 кГц, частота высокочастотного УЗ – 1 МГц. Время воздействия УЗ – 1 мин. Использован 50 % спиртовой раствор йодида натрия.

Следует также отметить, что использование ультразвука только одной низкой или только одной высокой частоты не приводит к растворению эмульгатора МГД в спиртовом растворе йодида натрия (табл. 4, табл.5).

Очевидно, это связано с соответствующими структурными изменениями раствора под воздействием УЗ данных параметров [7, 11].

Таблица 7

Влияние времени воздействия УЗ на растворимость пищевого эмульгатора МГД в спиртовом растворе йодида натрия.

Характеристики	Время воздействия УЗ, мин									
	Без УЗ	0	0,1	0,2	0,5	1,0	2,0	3,0	3,5	3,6
Растворимость эмульгатора МГД, г/100 мл	Не растворяется	40	41	42	55	58	59	58	56	51

Частота низкочастотного УЗ – 22 кГц, частота высокочастотного УЗ – 1 МГц. Интенсивность низкочастотного УЗ – 0,20 Вт/см², интенсивность высокочастотного УЗ – 0,60 Вт/см². Использован 50 % спиртовой раствор йодида натрия.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	РИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

В табл. 8 приведено сравнение методов получения йодированной поваренной соли, известного [6] и предлагаемого. Как следует из данных, приведенных в табл. 8, использование предлагаемого метода позволяет увеличить срок хранения йодированной соли до 2-х лет, при этом количество необходимого эмульгатора МГД может быть уменьшено с 2,5 до 1,0 г/кг пробы соли. Также следует отметить, что при использовании данного метода получения йодированной поваренной соли увеличивается до 2-х лет не только сохранность йода, но и уменьшается слеживаемость поваренной соли. То есть, использование данного метода позволяет уменьшить слеживаемость готового продукта (сопротивление сжатию считается допустимым

менее 0,3 кг/см²) и увеличить сохранность йода в йодированной поваренной соли до 2 лет.

Выводы

Таким образом, проведенные исследования показали, что использование ультразвука при приготовлении йодсодержащей добавки - раствора йодида натрия в эмульгаторе МГД позволяет увеличить срок хранения йодированной поваренной соли до 2-х лет. При этом используются безопасные компоненты: - йодид натрия, этанол и эмульгатор МГД (относится к пищевым веществам и используется при приготовлении маргаринов).

Таблица 8

Сравнение методов получения безопасной йодированной соли по [6] и предлагаемого.

№ пробы	Введено NaJ, мг/кг пробы	Введено эмульгатора МГД, г/кг пробы	Найдено NaJ, мг/кг пробы				Сопротивление сжатию, кг/см ²			
			9 месяцев	12 месяцев	18 месяцев	24 месяца	9 месяцев	12 месяцев	18 месяцев	24 месяца
Метод согласно [6]										
1	20	1,00	16,4	14,7	10,1	2,4	1,05	1,43	2,48	3,97
1	36	1,00	29,1	23,8	18,4	3,9	1,06	1,37	2,32	3,12
1	44	1,00	35,1	28,2	20,3	4,8	1,08	1,29	2,12	3,04
2	20	2,00	18,4	17,8	11,2	2,9	0,11	0,28	1,67	2,05
2	36	2,00	33,0	30,1	19,0	4,5	0,09	0,22	1,45	1,98
2	44	2,00	40,0	34,6	22,3	5,3	0,08	0,26	1,40	1,87
3	20	2,50	19,6	19,6	11,9	3,2	*	0,11	1,65	2,03
3	36	2,50	35,2	34,9	19,5	4,8	*	0,10	1,64	1,95
3	44	2,50	42,7	40,1	22,9	6,0	*	0,09	1,59	1,92
Предлагаемый метод										
1	20	0,50	17,5	17,0	15,1	12,3	0,11	0,28	1,03	2,12
1	36	0,50	33,2	33,9	18,4	14,7	0,09	0,21	1,05	2,12
1	44	0,50	38,7	38,2	25,3	21,3	0,08	0,23	1,05	2,14
2	20	1,00	19,7	19,4	17,2	11,5	*	*	0,11	0,28
2	36	1,00	35,9	35,2	32,0	29,5	*	*	0,09	0,27
2	44	1,00	44,0	43,8	40,3	35,3	*	*	0,10	0,28
3	20	1,50	19,9	19,7	18,7	18,2	*	*	*	0,11
3	36	1,50	35,8	35,6	33,8	32,3	*	*	*	0,09
3	44	1,50	43,4	42,9	40,7	36,0	*	*	*	0,09

*-Признаков слеживаемости не обнаружено

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

References:

- (1997) GOST 13830-97 (DSTU 3583-97) Sol' povarennaya pishchevaya. Obshchiye tekhnicheskiye usloviya
- Potts AM (1996) Toxic responses of the eye. In: Klaassen CD (ed) Casarett and Doull's Toxicology, Mc Graw Hill, New York, 1996, p. 601 – 602.
- Singalavaniya A, Dongosintr N, Dulayajinda D (1994) Potassium iodate retinopathy. Acta Ophthalmol (Copenh), 1994, v.72, p.513 – 519.
- Furman AA, Bel'dy MP, Sokolov ID (1989) Povarennaya sol'. Proizvodstvo i primeneniye v khimicheskoy promyshlennosti.–M.: Khimiya, 1989.– 272 p.
- Remi G (1963) Kurs neorganicheskoy khimii. T. 1.- M.: izd-vo inostrannoy litera-tury, 1963.- 920 p.
- Matveyeva TA, Baklanov AN, Selitrennikov YG (1989) Sposob iodirovaniya povarennoy soli – A.s. № 1491811, SSSR– Opubl. 07.07.89– Byul. № 25.
- (2012) Ul'trazvuk v analiticheskoy khimii i khimicheskoy tekhnologii: monografiya / A.N. Baklanov, A.P. Avdeyenko, S.A. Konovalova, L.V. Baklanova . - Kramatorsk: DGMA, 2012. – 332 p.
- Goloperov IV, Belova EA, Baklanov AN (2016) ULTRASOUND IN THE DETERMINATION CESIUM AND CESIUM-137 IN HIGHLY WATERS, BRINE AND SALT/ // «Theoretical & Applied Science. – 2016. –V. 33.- № 1. – p. 64-68.
- Yurchenko OI, Baklanov AN, Belova EA, Kalinenko OS, Baklanova LV (2015) ULTRASOUND TO INTENSIFY OF FOOD DRY MINERALIZATION BY THE OXIDANTS IN VAPOR FORM / // «Theoretical & Applied Science. – 2015. – V.27.- № 7. – p. 122-129.
- Lur'ye YY (1971) Spravochnik po analiticheskoy khimii.-M.:Khimiya, 1971.- 456 p.
- Margulis MA (1986) Zvukokhimicheskiye reaktsii i sonolyuminestsentsiya. – M.: Khimiya, 1986. – 288 p.



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 20.04.2017 <http://T-Science.org>

M.J. Huseinov

researcher,
Azerbaijan State Agrarian University,
Ganja, Azerbaijan

V.T. Amrahov

researcher,
Azerbaijan State Agrarian University,
Ganja, Azerbaijan
l-hasan@hotmail.com

**SECTION 31. Economic research, finance,
innovation, risk management.**

ABOUT ACADEMIC ISSUES OF NECESSARY FACTORS FOR DIVERSIFICATION OF PRODUCTION IN AGRARIAN SECTOR

Abstract: As in the other spheres of economy, integration to the world economic systems conditions the production of competitive goods in agrarian sector and makes necessary adopting the production process with market requirements. Due to the changes in market requirements, entities which produces the same or similar competitive goods for a long time starts to change their production structure.

It makes necessary the substantiate of diversification process in various production parts, such as identification of appropriate production parts taking into account climate conditions and potential of recourses and building more economically productive structure.

Key words: market, diversification, structure, potential of recourse, demand.

Language: English

Citation: Huseinov MJ, Amrahov VT (2017) ABOUT ACADEMIC ISSUES OF NECESSARY FACTORS FOR DIVERSIFICATION OF PRODUCTION IN AGRARIAN SECTOR. ISJ Theoretical & Applied Science, 04 (48): 76-78.

Soi: <http://s-o-i.org/1.1/TAS-04-48-12> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.12>

Introduction

Integration to the world economy and transformational changes in economic relations makes necessary adopting the production process with market requirement by producing competitive goods in agrarian sector. In turn this cause with abandon from traditional manufacturing, in order to take permanent and reliable place in the competitive struggle with manufacturers.

Thereby, due to the change in market demand, manufactures that were busy with producing the same or similar products for a long time change their production structure. That's why the substantiate of diversification process in various production parts, such as identification of appropriate production parts taking into account climate conditions and potential of recourses and building more economically productive structure considered to be one of the most important tasks [10].

Today the main trend of the diversification in agriculture considered to be the market conjuncture and the priorities of the diversification of agricultural products being identified depending on the changes in market conjuncture [4].

These contain objective characteristics of the relationship between business entities and markets at the different stage of the diversification process of

development of agriculture.

Changes happening in economy in different directions requires structural changes in accordance with market requirements. This direction which is specific for all fields of economy is especially necessary in the global economic transformational conditions. Because in such condition in order to protect internal market, measures should be applied for developing more competitive fields regarding to open market principles as well as the protection of agrarian sector which have complicated specification should be ensured.

Materials and Methods

In terms of mentioned here, the structural changes in agrarian production should directly ensure the long-term economic interests of the state from the point of view of the requirements of society. For this purpose, it's important to pay attention for solve of below issues:

- the measures intended to be implemented in agrarian sphere should be more sustainable for decreasing negative impact of imported goods which are more competitive;
- due to the direct impact of import-export operations to the development of agrarian sector and also the opportunity for keeping other countries



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PИИИ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

depending on the goods exported by the countries which achieved innovative economic progress, structural changes should be provided in conjunction with agrarian sector and other spheres of the economy [9].

- the economic essence of structural changes directed to the growth of agrarian sector also requires the identification of potential external markets in terms of competitive opportunities. From this point of view formation of strategic structural policy is extremely important.

Despite of the specialization in traditional production for a long time, the trend of change in economic process makes inevitable transition to new production fields. For this purpose, following matters should be taken into consideration and investigated by producers:

- analyzing the current situation of agricultural production;
- investigating the current situation of the recourse potential and use of them in accordance with the production direction;
- identifying the economic efficiency for different production fields;
- identifying the more economic efficient production fields taking into consideration market demand;
- Identifying the directions for improving economic efficiency of production and identifying more economically efficient production fields using recourse potential during diversification process.

The direction of diversification process is formed under the influence of complex factors and diversity of these factors plays important role for increasing the profit of producers. Therefore, in time scientific valuation of negative and positive aspects of economic changes before and after the diversification process and economic and scientific justification of measures which should be held are the important issues for producers [8].

The scientific basis of diversification strategy is the justification of its economic indicators, justification of its relation with logistic systems, harmonization of relations between fields being diversified and the economic valuation of diversification activities.

And it means that, before the changes in production structure, required information about possible outcomes of diversification process should be prepared and factors which can affect economic efficiency during production activity should be identified and taking into consideration of the positive aspects of these factors and the

implementation of measures for minimization of negative aspects are the main issues.

As in the other spheres of economy, integration to the world economic systems conditions the production of competitive goods in agrarian sector and makes necessary adopting the production process with market requirements.

Due to the changes in market requirements, entities which produces the same or similar competitive goods for a long time starts to change their production structure. It makes necessary the substantiate of diversification process in various production parts, such as identification of appropriate production parts taking into account climate conditions and potential of recourses and building more economically productive structure.

Conclusion

Analyze of the possible changes in the structure of agrarian production and factors for diversification shows that, there are number of matters which should be analyzed and taken into consideration:

- the structure of land recourses should be analyzed, provision of agriculture with suitable land should be investigated and the level of use of this land should be identified;
- the structure of labor recourses should be analyzed, the skills of employed peoples should be identified and factors which influence the employment should be valued;
- current situation of provision with water recourses should be investigated, level of use of this recourses should be identified;
- production direction of processing entities, processing capacity and the level of use of processing capacity should be investigated;
- the ratio, dependency, difference between cost and price and the factors influencing them should be valued;
- with identifying the production fields and cost of the product of field structure of agricultural goods and the role of the production costs and prices in formation of field structure should be identified and level of dependency between this indicator should be valued;
- efficient use of agricultural potential and current problems with developing economically efficient agricultural sector should be identified;
- requirement of the markets of agricultural goods should be identified, trend of change of demand depending on the consumption norm and population also the level dependency between supply and demand should be identified and etc.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

References:

1. Aliyev IH (2006) Development problems of national economy and agrarian sector. Baku, 380 p.
2. Andrianov AC (2006) Diversification of economic relations of business entities in competitive environment, Kazan, 225 p.
3. Aaker D (2007) Strategic Market Management, 7th edition, Piter, 496 p.
4. Dobryanskaya NA (2013) Diversification of Production as development factor of regional food market, Young Scientist 8th edition, pp. 188-190
5. Samarskaya AO (2012) Structural policy of the state as a condition for economic growth, 5th International student scientific e-conference, Student scientific Forum. February 15 – March 31, 2012
6. Pozdnyakov VY., Kazakov SV (2010) Economy of Industry: study guide, M.: INFRA-M, 309 p.
7. Kunch R (1994) Diversification and success strategy of entity, Problems of management theory and practice, 1st edition, pp. 96-100
8. Novichkiy EG (2001) Problems of strategic management of diversified corporation, M.: BUKVITSA, 199 p.
9. Xotyasheva OM (2006) Innovative Management, 2nd edition, Piter, 384 p.
10. Gort M (1962) Diversification and integration in American industry, Princeton, Princeton University Press, 508 p.



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 30.04.2017 <http://T-Science.org>

Aminjon Qudratovich Aymatov
Chief of Department
PhD, Assistant of Professor
The Samarqand State University,
Samarqand, Uzbekistan

SECTION 30. Philosophy

SOME ASPECTS OF THE RELATIONSHIP BETWEEN ENVIRONMENTAL CONSCIOUSNESS AND AESTHETIC PERCEPTION OF THE ENVIRONMENT

Abstract: In this article some principles and aspects of forming and developing of environmental consciousness and aesthetic perception of world of nature and world of human are considered.

Key words: nature, humanity, ecology, environment, environmental consciousness, aesthetical perception, aesthetical education, students.

Language: English

Citation: Aymatov AQ (2017) SOME ASPECTS OF THE RELATIONSHIP BETWEEN ENVIRONMENTAL CONSCIOUSNESS AND AESTHETIC PERCEPTION OF THE ENVIRONMENT. ISJ Theoretical & Applied Science, 04 (48): 79-82.

Soi: <http://s-o-i.org/1.1/TAS-04-48-13> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.13>

Introduction

Nature is an inexhaustible and eternal source of beauty. The moral and aesthetic relation to nature is enriched by its reflection in the artistic images of literature and art [1, p. 18].

Aesthetic education through observation and study of the beautiful nature is the process of the essential formation and spiritual development of man. The aesthetic sense of nature is important to shape when the children's spiritual world is formed, and they are especially sensitive, sensitive to beauty [2; 3].

Formation of ecological culture of students is one of the main directions of the general strategy of education. The actuality of environmental education is dictated by life itself. An important direction in the formation of ecological culture is the development of humane attitude to nature, the ability to perceive and feel its beauty, the ability to take care of all natural components. The basis of both national and world development should be the harmony of man and nature. Thus, it is impossible to separate the aesthetic education from the ecological one [4; 5].

The system of additional education has great opportunities for revealing the ability of children to creativity, and allows the realization of aesthetic education and environmental education in the complex. Additional education of children is a necessary link in the education of a multifaceted personality, its education, early professional

orientation. It is diverse and multidirectional. The value of supplementary education is that it enhances the variable component of general education and helps students in professional self-determination, contributes to the realization of the forces, knowledge gained in the basic component of training.

Ecological and aesthetic education of students in the system of additional education may be meaningfully carried out in the following associations: "Natural Workshop", "Phytodesign", "Decorative Composition - Mirror of Nature", "In the Animal World", "Ecology of Man", "Ecology", "Nature and creativity".

Materials and Methods

An effective method of forming a moral and aesthetic relation to nature is the statement of problem situations and during excursions, and during classes in the classroom, on the school site, during the game. Cognitive situations are more often offered by the teacher.

The formation of a person's aesthetic attitude to nature is no less urgent today than the formation of ecological thinking. Moreover, it can be safely asserted that the aesthetic awareness of the value of the natural environment is closely related to the notion of ecological consciousness.



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

Ecology as a form of social consciousness is part of the biological science that studies the patterns of interaction and relationships within fauna and flora, their representatives among themselves and with the environment.

The world of nature is the environment of man. He is interested in preserving integrity, purity, harmony in nature and preventing violations of biological interaction and balance. At the same time, through his active transforming activity, a person intervenes in natural processes, violates them, and uses the riches of nature in his own interests. If this activity takes place uncontrolled, without taking into account ecological regularities and renewal of renewable resources, the biological balance in nature can be irreparably damaged, which generates processes that threaten human life. There are environmental problems on a global scale, as well as regional ones. Only the efforts of the entire world community can preserve the purity of the atmosphere, save the world ocean from pollution, reasonably regulate the use of the earth's interior, preventing their complete depletion. However, each individual country can and should take care of preserving the environment in its region: monitor the state of air purity, combat the destruction of forests, fauna and flora, do not pollute rivers and water bodies, promote a culture of farming and preserve soil.

Nature is for people an object of knowledge and an aesthetic relationship. Its phenomena are aesthetically perfect and provide the aesthetically developed person with deep spiritual pleasure. Penetration into its secrets contributes to the formation of a scientific worldview. This necessitates the implementation of universal, compulsory, initial ecological education, laying the foundations of the ecological culture of man.

Ecological consciousness includes environmental knowledge: facts, information, conclusions, generalizations about the relationship and exchange that take place in the world of animals and plants, as well as in their environment and in the environment in general. Its component is aesthetic feelings and environmental responsibility. They encourage people to be cautious in relation to nature, to anticipate in advance and 'prevent possible negative consequences of industrial development of natural waters, land, atmosphere, forest. The use of nature by man requires a developed ability of ecological thinking from him. It manifests itself in the ability to effectively use environmental knowledge in the creation of industrial and agricultural facilities, in a creative approach to preventing and eliminating the negative consequences for nature of certain technological processes of production. The environmental consciousness includes man's strong-willed aspirations aimed at protecting nature, actively

fighting off violators of environmental protection legislation.

Ecological consciousness performs important functions [6].

The educational function helps to understand nature as an environment of human habitation and as an aesthetic perfection. The younger generation is inspired by the idea of using ecological knowledge in order to preserve nature, preventing a dangerous and irreversible violation of ecological balance.

The developmental function is realized in the process of formation in children of the ability to comprehend ecological phenomena, to establish connections and dependencies existing in the world of plants and animals; Draw conclusions, generalizations and conclusions about the state of nature; Give recommendations for reasonable interaction with her.

The educational function of environmental consciousness is manifested in the formation of students' moral and aesthetic attitude to nature. The sense of duty and responsibility organically merges with a sense of admiration for the grandeur and beauty of the real world. This encourages students to environmental activity. Their deep knowledge of their native nature, active love for its enrich and strengthen patriotism.

The organizing function is to stimulate the active environmental activities of students. They take part in the construction of industrial enterprises, land use, harvesting of timber, harvesting of herbs - everything was done in strict accordance with the law on environmental protection. Environmental consciousness makes it a norm for future participants in the construction of treatment facilities, the restoration of forests and soil fertility, preservation of the integrity of the main natural processes, wildlife sanctuaries and reserves. Ecological consciousness involves schoolchildren in the struggle for peace, for the survival of people, against the atomic war that inevitably leads to a "nuclear winter" and the death of all life on Earth.

The prognostic function of ecological consciousness is to develop in children the ability to predict the possible consequences of certain human actions in nature; what is the violation of ecological processes leading to? What actions are environmentally neutral, and what activities need to be carried out for the benefit of nature. Ecological forecasting is an indispensable condition for literate planning, the allocation of productive forces and the development of the entire national economy.

Effective realization of the functions of ecological consciousness leads to the formation of ecological culture among children. It includes environmental knowledge, deep interest in environmental activities, the competent implementation of it, the wealth of moral and

Impact Factor:

ISRA (India)	= 1.344	SIS (USA)	= 0.912	ICV (Poland)	= 6.630
ISI (Dubai, UAE)	= 0.829	PIHHI (Russia)	= 0.234	PIF (India)	= 1.940
GIF (Australia)	= 0.564	ESJI (KZ)	= 3.860	IBI (India)	= 4.260
JIF	= 1.500	SJIF (Morocco)	= 2.031		

aesthetic feelings and experiences generated by communication with nature.

Ecological consciousness as an important part of the world outlook of students is formed in the process of ecological education. It is a systematic pedagogical activity aimed at developing the ecological education and upbringing of children; The accumulation of ecological knowledge, the formation of skills and activities in nature, the awakening of high moral and aesthetic feelings, the acquisition of highly moral personal qualities and a firm will in the implementation of environmental work. Ecological education is carried out as a result of purposeful training. Students in the process of studying various subjects are enriched with environmental knowledge. Moral and aesthetic education focuses children's attention on the careful attitude to nature, love for it, and the ability to enjoy its beauty. Socially useful work accustoms teenagers to nature protection work. This relationship and the conditionality of a variety of activities determine the system of ecological education [7].

The purpose of the system is to develop the ecological consciousness of children as a combination of knowledge, thinking, feelings and will; in the formation of their ecological culture; In readiness for active environmental protection. The system is implemented in the lessons of biology, geography, physics, and chemistry. Biology and geography paint a picture of the ecological state of the modern world of plants, animals, and the whole environment for children. The children learn what ecological balance is like plants, insects, birds, animals, forests and fields, the depths of the earth and the atmosphere interact with each other, creating for each other biologically normal, favorable conditions of existence. Ants, as nurses, clean the forest, insects feed birds, Flood Rivers create floodplain meadows, the forest cleans the air, protects the fields from weathering, snow covers the fields and nourishes them with moisture. The knowledge of these connections makes it possible to create in the worldview of schoolchildren the notion of wholeness, unity and universal interconnection in nature. It convinces students that the violation of these links changes the biological balance in nature, inflicts irreparable damage on it, worsens the human condition. Physics and chemistry give students a complex of polytechnic knowledge, scientific foundations and principles of modern production. Students learn about the nature of production, its interaction with the natural environment on the principles and devices to prevent the harmful effects of technological processes, on the possibilities of organizing non-waste production, which are of great economic and environmental significance.

Objects of the humanitarian and aesthetic cycle contribute to the formation of the ecological consciousness of the students. History, social

science, the foundations of the state and law show the inadmissibility of the barbarous attitude to nature, its predatory exploitation. The children will learn about the legislation that regulates relations to the nature of state and public organizations, of all people. The aesthetic cycle: literature, visual arts, music reveal the aesthetic essence of nature, its unique beauty, which has a huge impact on morality, the state of the human spirit, its relation to nature and all life. Art animates nature, ties the person with it, makes it possible to recognize oneself as its integral part [8].

With the environmental activities of children inextricably linked to tourism and local history work. She teaches schoolchildren to observe the rules of behavior in places of rest, in forests and on rivers, to monitor the state of nature, to accumulate impressions for artistic expression in their own literary, musical, and visual arts.

A considerable help to the school in the environmental education of children is provided by the mass media. Children's and youth literature, newspapers and magazines pay much attention to fostering respect for nature. Radio and television organize children's environmental activities: explain how to help animals and birds in winter, how to take care of pets and plants, how to monitor the cleanliness of forests, parks, rivers.

Effective implementation of environmental education depends on the resolution of some contradictions. It is important for students to realize that, since nature is the source of all material wealth, people have a desire to take as much as possible. At the same time, its reserves are not infinite, and their irrational expenditure harms both nature and people. The contradiction is overcome if the activity of man in nature is directed simultaneously to its use and preservation. Another objective contradiction. Nature is the most important factor in the upbringing of children, their mental, aesthetic, moral development. Meanwhile, urbanization, the widespread introduction of mechanization, automation of production processes, especially in rural areas, alienates children from nature; substitute the spiritual and aesthetic attitude to it with utilitarian and practical. Contradictions are resolved in the course of purposeful ecological education as a result of the main mechanisms of personality formation: cognitive, practical activity in nature, aesthetic development of the natural environment.

Conclusion

So, ecological education is carried out in inseparable connection with the mental education as part of the world outlook, the general knowledge of the world; With the labor, helping to realize the ecological beliefs of children in reality; With an aesthetic, developing a sense of beauty of nature and stimulating the environmental activities of students;

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

With a moral, forming a sense of responsibility in relation to nature and people. The main indicators of ecological education are the students' understanding of contemporary environmental problems, the

consciousness of responsibility for the preservation of nature, active environmental protection, a developed sense of love for nature, the ability to see beauty, to admire and enjoy it.

References:

1. Pechko LP (1984) *Ekologicheskoe i esteticheskoe vospitanie shkol'nikov / pod red. L. P. Pechko. M.: Pedagogika, 1984. 136 p.*
2. Smol'yaninov IF (1984) *Priroda v sisteme esteticheskogo vospitaniya: kn. dlya uchitelya. M.: Prosveshchenie, 1984. 207 p.*
3. Timoshenko LG (2009) *Pedagogicheskie usloviya esteticheskogo vospitaniya detey v uchrezhdeniyah dopolnitel'nogo obrazovaniya // Vestn. Tomskogo gos. ped. un-ta (Tomsk State Pedagogical University Bulletin). 2009. Vyp. 2 (80). p. 53-56.*
4. Egorova NN (2004) *Ekologicheskaya kul'tura v sisteme obrazovaniya: istoricheskoe razvitie // Tam zhe. 2004. Vyp. 5(42). p. 170-174.*
5. Zyateva LA (2002) *Filosofsko-pedagogicheskie vozzreniya otechestvennyh uchenyh na problemu ekologicheskogo vospitaniya // Pedagogika. 2002. № 7. p. 32-40.*
6. Kuldashev A (2013) *Ekologicheskaya sociologiya: al'ternativnye prognozy // «Credonew» Journal. 2013, №3 (75). – p. 147-153.*
7. Omonov BN (2013) *Geoekologicheskaya politika Uzbekistana v regione Priaral'ya // Tam zhe. – p. 261-268.*
8. Deryabo SD, Yasvin VA (1996) *Ekologicheskaya pedagogika i psihologiya. R.-na-D..*
9. Aymatov A (2017) *Ekologicheskoe soznanie i formirovanie esteticheskogo otnosheniya lichnosti k prirode (na primere shkol'nogo obucheniya) // Available: http://www.intelros.ru/readroom/credo_new/k3-2014/25378-ekologicheskoe-soznanie-i-formirovanie-esteticheskogo-otnosheniya-lichnosti-k-prirode-na-primere-shkol'nogo-obucheniya.html (Accessed: 20.04.2017).*
10. Kozlova ON (1994) *Vvedenie v teoriyu vospitaniya. M..*
11. Lihachev BT (1985) *Teoriya esteticheskogo vospitaniya. M..*



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHII (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 30.04.2017 <http://T-Science.org>

Otabek Muhammadievich G`aybullaev
The Samarqand State University
Chief of Department
Doctor of science, Professor
Samarqand, Uzbekistan

SECTION 30. Philosophy

SOME ASPECTS AND HISTORICAL FACTORS OF INTEGRATION PROCESSES IN SPHERE OF GLOBALIZATION OF THE ECOLOGICAL POLICY

Abstract: Given article is devoted disclosing of defining factors of the majority of the integration processes, concerning spheres of globalization of an ecological policy. Stages of formation of the international ecological policy, a direction, forms and principles of the international cooperation in ecology sphere, the international agreements in the field of preservation of the environment, concern them first of all.

Key words: globalization, ecology, economy, society, ecological policy, integration processes.

Language: English

Citation: G`aybullaev OM (2017) SOME ASPECTS AND HISTORICAL FACTORS OF INTEGRATION PROCESSES IN SPHERE OF GLOBALIZATION OF THE ECOLOGICAL POLICY. ISJ Theoretical & Applied Science, 04 (48): 83-86.

Soi: <http://s-o-i.org/1.1/TAS-04-48-14> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.14>

Introduction

Global character of ecological crisis causes necessity of realization of the international ecological activity. In development of the international cooperation in the field of environment protection it is possible to allocate some stages:

1. 60-70th years of the XXth century – it is connected with formation of system of the international nature protection cooperation.

2. 80-90th years of the XXth century – has marked itself the beginning of working out and realization of Strategy of a Sustainable Development.

3. 1995-on the present – it is connected with realization of a Sustainable Development and cooperation of the international nature protection activity of the states.

Let's consider the basic achievements and lacks of the first period of the international ecological cooperation.

Local character of the agreements mentioning only separate aspects of global problems became characteristic feature of the first stage of the international ecological integration. In 50-60th years some forums and the conferences devoted to preservation of the environment have been spent, and a number of agreements of local type is signed. The resolution of XVII Session of General Assembly of the United Nations Organization, accepted in 1962 became one of the first documents of global

importance. There has been noticed that economic development and wildlife management should be synchronous and pass under the control of the international public organizations in it.

Materials and Methods

In 1968 intergovernmental conference on problems of biosphere with participation of UNESCO, the World Association of Public Health Service, the International Union of Wildlife Management where for the first time have been considered scientific principles of wildlife management and protection of natural resources has taken place. Since 1970 has began to be realized under the aegis of UNESCO the long-term program of preservation of the nature "The Human and the Biosphere".

Bases of an ecological policy of the modern state have been put in 1971 on the international symposium in the Swiss city of Fune. Acceptance in 1972 of the Stockholm declaration at the Conference of the United Nations on environment became the turning point of the first period. It has been proclaimed, that "... preservation and improvement of quality of environment surrounding the person is the important problem influencing on well-being of the people..." Also it has been recognized, that "the person has a fundamental law on freedom, equality



Impact Factor:

ISRA (India)	= 1.344	SIS (USA)	= 0.912	ICV (Poland)	= 6.630
ISI (Dubai, UAE)	= 0.829	PIHHI (Russia)	= 0.234	PIF (India)	= 1.940
GIF (Australia)	= 0.564	ESJI (KZ)	= 3.860	IBI (India)	= 4.260
JIF	= 1.500	SJIF (Morocco)	= 2.031		

and favorable living conditions in the environment which quality allows conducting a worthy and prospering life, and bears the main responsibility for protection and environment improvement for the blessing present and the future generations”.

The human rights on favorable environment began to be fixed in new Constitutions of the countries accepted after 1972, and also in the general laws on protection of a surrounding environment. The declaration of principles accepted at the Stockholm conference, included 26 principles in relation to an environment problem. Among them human rights on favorable environment; preservation of natural resources for present and future generations; economic and social development; the sovereignty of the rights of the states on working out of own natural resources and responsibility of the states for a damage to environment; necessity of the joint decision of global problems and others. The plan of measures contained 109 points in sphere organizational, economic, political problems of preservation of the environment. The Stockholm declaration became the first large agreement considering problems of transboundary pollution. The basic export of an ecological damage had been declared those developed countries in which territory in areas of concentration of the industry high level of environmental contamination was observed. Under the conference decision has been formed UNPE (the United Nations Program on Environment) – constantly operating body of the United Nations on preservation of the environment, Environment Fund, and on June, 5th it has been proclaimed as the World Day of Environment.

Following step became the signing of the Final certificate of Meeting on safety and cooperation in Europe in Helsinki in August, 1975 with participation of all European countries, the USA and Canada where along with political questions of ensuring of safety have been fixed questions of ecological safety, were defined the purposes, areas, forms and methods of the international ecological cooperation. Atmosphere pollution abatement, protection of waters has been carried to cooperation areas from pollution, protection of the sea environment, protection of soil, reserves, environment in cities. Among forms and methods of such cooperation were offered: information interchange, the organization of conferences, an exchange of scientific researchers.

Within the limits of realization of the Helsinki decisions by the countries-participants the Convention on transboundary pollution of atmospheric air (1979), the Convention on transboundary influence of industrial failures (1992) and others subsequently have been accepted. In 1982 at special session UNPE the Nairobi declaration which has confirmed principles of the Stockholm conference has been proclaimed.

The recognition of a priority of the joint decision of global problems became the basic achievement of the first stage of development of the international cooperation. However the basic efforts went on overcoming of consequences of deterioration of ecological conditions, instead of on elimination of the reasons. The majority of documents have not brought a significant positive effect because of considerable economic costs.

Working out of the global strategy directed on elimination of the reasons to degradation of an environment became the major problem for the second period.

The second stage covers the period 80-90th years of the XXth century. For preparation of global nature protection strategy has been created the International Commission on Environment and Development (ICED), considered two approaches to the decision of problems of environment – traditional and alternative.

The first placed emphasis on environmental contamination problems (climate change, atmosphere pollution, a radioactive waste, potable water problems etc.); problems connected with natural resources (deforestation, desertification, an exhaustion of sea resources); problems of settlements of the human (land tenure, water supply, high rates of an urbanization). According to ICED, the traditional approach has led to considerable progress in the field of environment monitoring, to growth of ecological awareness of the public. However the undertaken nature protection activity was limited, as a rule, to the developed countries, disregarding problems of developing countries.

As a result, ICED has suggested using the alternative approach considering the general sources of environmental problems in following directions:

- Perspectives of demographic growth and economic development;
- Energy, environment and development (including ozone layer problems, air pollution, the acid rains, renewed resources, etc.);
- The industry, environment;
- Agriculture, environment and development;
- Global ecological monitoring.

The report “Our General Future” became a result of work ICED, in which the concept of steady social and economic development in balance with environment for the first time has been put forward.

On the basis of the Concept of the Sustainable Development the international cooperation in the field of ecology was carried out up to the end of XX century. Its ideas have laid down in a basis of variety of the international contracts and agreements. Among them the Viennese report 1986 on decrease in emissions of hydrocarbons and others pollutants; the Montreal report on protection of an ozone layer of 1987; the Hague declaration of 1989 in which was underlined that global problems demand creation of

Impact Factor:

ISRA (India)	= 1.344	SIS (USA)	= 0.912	ICV (Poland)	= 6.630
ISI (Dubai, UAE)	= 0.829	PIHHI (Russia)	= 0.234	PIF (India)	= 1.940
GIF (Australia)	= 0.564	ESJI (KZ)	= 3.860	IBI (India)	= 4.260
JIF	= 1.500	SJIF (Morocco)	= 2.031		

the new organization in the United Nations allocated with the right to make of the decision even in the absence of unanimity and to impose penalties for infringement of the international agreements.

Sustainable Development principles have found reflexion in final documents of the international conference in Rio de Janeiro of 1992 which has marked itself end of working out of the Concept of the Sustainable Development. Conference has collected about 15 thousand delegates from 178 countries of the world. Its basic decisions became "The declaration of principles of a policy of preservation of the environment" and "The agenda – The XXIst century". The sustainable development has been defined as the process meeting requirements of the present, but not depriving future generations the possibility to satisfy its requirements.

In the United Nations the special Commission on a sustainable development has been created. "The agenda" included more than 100 programs on global problems and formulated the conditions necessary for a sustainable development of all countries. Besides, in Rio de Janeiro contracts about principles of protection and rational use of woods of all climatic zones have been concluded; the Convention on a climate; the Convention on protection of a biological variety and others. These documents reflected intentions of the state-participants to develop international ecological cooperation on the basis of sustainable development principles, however they did not contain any obligations.

In December, 1997 representatives of 159 states have gathered at the world ecological forum in Kyoto which were passing under the aegis of the United Nations. The Kyoto report has fixed obligations of the countries of the European Union to reduce the general emissions of polluting substances in environment on 8 % in comparison with 1990 around 2008-2012. The USA has stipulated for themselves a boundary in 7 %, and Japan – in 6 %. Despite the ambiguity, the Kyoto report has been signed by 40 countries, but not all ratified it. Refusal of the countries to participate in the Kyoto agreement explain that benefits on prevention of climatic changes are expected only in long-term prospect, and costs become notable at once. Another argument is scientific uncertainty acts. Till now there is no common opinion, whether there is actually a global warming and how much it is caused by anthropogenous influences, including emissions in atmosphere of hotbed gases. Thereupon there is a

question, how much are defensible economic expenses for the problem decision which scale of consequences else up to the end is not clear.

The Kyoto report has finished the second stage of the international ecological integration. For this period much has been reached in respect of comprehension of necessity of harmonization of economic growth and development of a surrounding environment. For rather short time the system of the international cooperation in the field of protection of the environment, focused on elimination of the reasons of deterioration of ecological conditions has been generated. It included cooperation within the limits of the international intergovernmental and non-governmental organizations; cooperation within the limits of multilateral and bilateral agreements. It is possible to consider as the main result is formation of the complete Concept of the Sustainable Development.

At the same time it is obvious that notable positive results of ecological integration following the results of two periods has not followed. There was a necessity of search of new ways of the decision of global environmental problems.

At the present stage of the international cooperation in ecology sphere interstate cooperation continues to develop actively. By this time is over 1600 multilateral conventions and agreements and over 3000 bilateral contracts, partially or completely devoted to environment protection.

Conclusion

There are a lot of problems. In the majority they rest in finance expenses. Market mechanisms are realized in insufficient degree (questions of payment for environmental contamination are not solved), financing of numerous ecological programs and projects frequently appears under the threat. At the present stage it is possible to consider as success increase in quantity of the countries which have signed the Kyoto report (among them and Russia). However it cannot be considered effective, yet do not ratify all developed countries, first of all the USA. At the same time at all ambiguity of the Kyoto report it has executed the paramount role, having brought on the agenda an attention to the question on necessity of reduction of negative ecological consequences from economic activities and have been stimulate working out of is standard-legal tools and introduction of market mechanisms in ecological sphere.

Impact Factor:

ISRA (India)	= 1.344	SIS (USA)	= 0.912	ICV (Poland)	= 6.630
ISI (Dubai, UAE)	= 0.829	PIHHI (Russia)	= 0.234	PIF (India)	= 1.940
GIF (Australia)	= 0.564	ESJI (KZ)	= 3.860	IBI (India)	= 4.260
JIF	= 1.500	SJIF (Morocco)	= 2.031		

References:

1. Nikanorov AM (2000) Global'naya ekologiya / A.M. Nikanorov, T.A. Horuzhaya. –M., 2000. – 284 p.
2. (2003) Ekologicheskaya politika / [pod red. S.V. Ustinkina]. – N. Novgorod, 2003. – 151 s.
3. Ekologiya / [pod red. S.A. Bogolyubova]. – M., 2002. – 286 p.
4. (2004) Ekologiya / [pod red. V.V. Denisova]. – Rostov n/D. – 2004. – 671 p.
5. (2005) Ekologicheskoe pravo / [pod red. O.L. Dubovika]. – M., 2005. – 767 p.
6. Ivanova AL (2003) Pravo ES ob obrashchenii s othodami / A.L. Ivanova // YUridicheskiy mir. – 2003. – № 9. – p. 35–48.
7. Lopashin VN (2004) Ekologicheskaya bezopasnost': problemy konstitucionnoy zakonnosti / V.N. Lopashin // Gosudarstvo i pravo. – 2004. – № 2. – p. 21–31.
8. (1995) Obzor zakonodatel'stva gosudarstv-chlenov SNG i stran Baltii : Voprosy sotrudnichestva v oblasti ohrany okruzhayushchey sredy // Zakonodatel'stvo i ekonomika. – M., 1995. – Vyp. 21/22. – p. 157–159.
9. Petrova TV (2000) Ekonomicheskiy mekhanizm realizacii ekologo-pravovyh norm / T.V. Petrova. – M., 2000. – 64 p.
10. Rengeling GV (2003) Evropeyskiy kodeks okruzhayushchey sredy: utopiya ili deystvitel'nost'? / G.V. Rengeling // Ekologicheskoe pravo. – 2003. – № 3. – p. 34–35.
11. Tret'yakova AA (2003) Ekologicheskie prava grazhdan po zakonodatel'stvu gosudarstv-chlenov Evropeyskogo soyuza. – M., 2003. – 207 p.



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 30.04.2017 <http://T-Science.org>

Ruzi Rabievich Komilov

Researcher
Samarqand Regional Institute
of Retraining and Advanced training
Workers of Public Education
Samarqand, Uzbekistan

SECTION 30. Philosophy

AESTHETIC COMPONENT OF WEDDING CEREMONIES OF THE UZBEK PEOPLE

Abstract: In this article some moments of one of the most important ceremonies in the life of every Uzbek - the wedding are considered. This ceremony in Uzbekistan is interesting for its special features, customs and traditions. This feast is accompanied by various rituals, in which a large number of relatives and friends of the groom and the bride's family are received.

Key words: Uzbek people, wedding ceremony, nikokh, kelin salom, folklore, fatih-tui, kelin tui, katlama tuyi, tobok zhuntish, kelin tushdi, campyr uldi, tukkiz tobok.

Language: English

Citation: Komilov RR (2017) AESTHETIC COMPONENT OF WEDDING CEREMONIES OF THE UZBEK PEOPLE. ISJ Theoretical & Applied Science, 04 (48): 87-89.

Soi: <http://s-o-i.org/1.1/TAS-04-48-15> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.15>

Introduction

Uzbek wedding is necessarily a long and serious process, which is prepared long before the celebration. It all starts with finding the right bride for your adult son. To this end, through familiar parents, they gather all the necessary information about the girl: about her social status, level of education and upbringing, her ability to lead a household.

After a suitable candidate is found, the guy's parents send matchmakers to the house to the bride. The task of the matchmakers is special; it is they who are responsible for the first impression to draw a conclusion about both the girl's family and the bride herself. A sharp eye of the matchmaker inspects the level of order and cleanliness in the house, carefully watching the girl's ability to look after the guests.

Usually the matchmaker is greeted with cordiality, invited to the table, singing tea. However, quite often the party of the bride from the first time gives the consent to give out the daughter. Usually only for the third time, when the parties come to an agreement, as a positive response - they break a cake. This ceremony is called "non-syndicate" and means the final consent of the parents of the bride.

After this, the date of the engagement is "fatih-tui". The engagement is celebrated a little more with a smaller scope than the wedding itself. On this day, the groom's party presents the bride's mother with

various gifts. They bring money, sweets, beautiful fabrics, sheep meat.

Materials and Methods

In general, the cost of a wedding banquet is borne by the groom's side. But in some areas, for example in Tashkent, the parents of young people agree in advance on the distribution of expenses on the occasion of the wedding event.

On the day of the wedding celebration in the house of the bride early in the morning prepare a festive pilaf, which is invited exclusively to men.

In the afternoon, the groom, dressed up in a festive costume, which, as a rule, he buys the side of the bride, comes to the house of his chosen one. In some areas, for example, in Bukhara, a gold embroidery chapan is worn over the costume, which is taken off before leaving the registrar with the bride. Modern Uzbek brides wear white wedding dresses for official registration. The face must be covered with a veil, so that the young girl is not jinxed.

Usually, before registering with the Registry Office, young people undergo a religious ceremony of marriage "nikokh". The Imam reads the appropriate prayers, and the young give promises to respect each other throughout the marriage life. During this ritual, the newlyweds wear national festive clothes.



Impact Factor:

ISRA (India)	= 1.344	SIS (USA)	= 0.912	ICV (Poland)	= 6.630
ISI (Dubai, UAE)	= 0.829	PIHHI (Russia)	= 0.234	PIF (India)	= 1.940
GIF (Australia)	= 0.564	ESJI (KZ)	= 3.860	IBI (India)	= 4.260
JIF	= 1.500	SJIF (Morocco)	= 2.031		

While escorting a young woman from her home, she is sent a full set of dowry, which includes everything necessary for the first period of family life: kurpacha, towels, and household utensils.

After the wedding banquet, coming to the groom's home, the young people walk around the fire three times before they enter the house, which means their cleansing and the beginning of the marriage life.

The next day, after the wedding night, the bride is not disturbed. She may not even leave her room, for the first three days she is considered a guest. A couple of days the bride is taken out for the ritual "kelin salom". On this day guests come and give the bridegroom various gifts, and as a token of gratitude the girl should bow to the guests in the belt.

These are the main rites that are observed in almost all areas of the country. In different regions, post-wedding activities can take weeks. But their main goal remains the same - to provide young people a happy and prosperous life.

It is known that in the territory of our country for some hundreds of years, original folklore traditions were formed that reflected the systems of national values existing in each region, folklore performance. From this point of view, the genre elements of the Uzbek wedding ritual are distinguished by their varied rituals, customs and traditions. Folklore and ethnographic records made in the Ishtikhan district of the Samarkand region confirm this diversity. Records made by the famous scientist Muzayan Alavia testifies that in the 60s of the 20th century, In the Ishtikhan district of the Samarkand region there was a wedding ceremony, on the eve of the "kelin tui" (wedding at the bride) from her house to the groom's house forty cakes (patyr), forty thin tortillas (katlama) cooked in butter, two fine thin cakes), Two tortillas (patyr). Having received these thin tortillas (katlama), the groom's parents, slaughtering a ram or bull, celebrated the ceremony of "katlama tuyi" - a wedding dedicated to a thin cake (pancakes). For this purpose, neighbors, close relatives met. Swatam-women who brought katlama were given expensive silk fabrics. In each bowl from katlama put 5-6 kg. Fruit and cut material.

This wedding ceremony was called "tobok zhuntish" (exchange of dishes), and it was repeated twice between the parents of the bride and groom.

During the second time the dishes were exchanged, various sweets were sent from the groom's side: fruits, sweets, cookies and also expensive silk material, a mirror, rings, earrings. And also together with all this send a bull or a ram. After receiving these gifts, the wedding ritual was performed by the bride, "damage to the bishots" (measurement of the material)", "porcha bichuv"(material cut).

On the day of this ritual, part of the gifts received from the groom were distributed to the bride's relatives.

In the Ishtikhan district, close friends of the groom are called "kuevboshlar (companions of the groom)", and the closest among them is "kuyevboshlatar" (best man). On the day of the ritual "kelin tushdi" (bride's arrival) the groom's friends were received in a separately decorated room, and the daughter-in-law of the bride treated them. The first dish to which the groom's friends were treated was called scrambled eggs, and the dishes in which they brought the dish were called "tanish tobok" (familiar dishes). After the groom's friends ate the eggs, they threw money into the dishes. After the feast, the ritual "Nikoh kiyish" (wedding) was held. After the religious ceremony, the daughter-in-law of the bride dressed the groom, put on a robe (kuyov chapan), skullcap, waist shawl and escorted by the groom's friends led to the middle of the courtyard where the fire was burning. The bridegroom three times walked around him and bowed to all those present, then the groom and his friends went to the room where the bride's dowry was. At the door the groom's friends gave the daughter-in-law of the bride a piece of material with the words "eshik iluva" (ask permission to enter the room). The snows of the bride, in turn, poured at the foot of the groom a carpet material. Behind the threshold of the bride's room lay an old woman, portraying the image of a barking dog. This ritual was called "it irillatarar" (dog barking) is performed with the goal that the groom has many children, so that evil spirits will bypass them and. And the other old woman was lying on the bed in the middle of the room, depicting the deceased, and this ritual was called "campyr uldi" (the old woman died). After receiving the gift from the groom's friends, the old woman "came to life."

The groom's friends lined up in a row and bowed to him several times. After that, permission was given to sit down. Everyone sat, except the groom and his best man, After the groom's mother-in-law said the following words: "The calf's my heifer is now yours (belongs to you)", the groom and his driver got in. The dastarkhan was covered with all sorts of dishes: pancakes, katlama, bugirsak (buns), flat cakes, samsa, brisket, lamb. This ceremony is called "tukkiz tobok" (nine kinds of dishes). The sweetest piece of brisket was given to the groom, who hid behind the backs of friends. Friends of the groom, having tasted of nine dishes everything that remained, was wrapped in belbog (a waist shawl) and threw money into empty utensils. After that, each of the friends of the groom and himself handed out a handkerchief out of his dowry. All friends, except the groom and the chauffeur, left the room.

One of the daughter-in-law came up to the kuyovboshlatar, elbowed the hole in the kurpache and the kuyovboshlatar filled this hole with money. After that, the daughter-in-law turned to him with the words: "Buzarimni Bering currents" (show signs of

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHII (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

love). Kuyovboshlatar gives her, and she, in turn, gives him a shirt "yataka" and a waist shawl. After that, all the dowry of the bride was prepared for export.

According to the ethnographer G. Tosheva, in the Kasan and Chirakcha districts of the Kashkadarya region this ritual is called "fossa filling". According to this ceremony, when the groom came into the room to pick up the bride, one of the old women from the bride's side formed a pit in the kurpache and screamed "the hole was not filled." After the groom filled this hole, he was allowed to remove the dowry of the bride. In the Ishti Khan fog on the wedding day, the bride was not at her home, but together with her friends "hid" in one of the houses of her neighbors. The snows brought the bride into the house, put her on the kurpach (mattress) and gave it

to the baby's hand and went out to the groom in this way.

Conclusion

This shows that the traditional genres of the Uzbek wedding rite in each region, in each fog have their own, local characteristics and differ very significantly in details. Wedding rituals are diverse since the days of Uzbek folklore and ethnography, it is expressed in many specific features. Their presence since ancient times has a significant specificity. On the basis of the wedding rite in each region there are their customs and rituals reflecting the worldviews of the local population differ from each other depending on the region. Therefore, the list of Uzbek wedding folklore is diverse.

References:

1. Ugvinovich DY (1975) Obryady: za i protiv. - M.
2. Genkik DM (1975) Massovye prazdniki. - M.
3. Suhanov IZ (1976) Obychai, tradicii i preemstvennost' pokoleniy. - M.
4. Sarsenbaev NS (1974) Obychaya i tradicii v razvitii. - Alma-Ata.
5. Tul'ceva LA (1985) Sovremennye prazdniki i obryada narodov SSSR. - M.
6. Gashurov G (1986) Umumhalk urf-odatlari halk kalbida. - Tashkent.
7. Lobacheva NP (1975) Razlichnye obryadovye komplekсы v svadebnom ceremoniale narodov Sredney Azii i Kazahstana. // Domusul'manskie verovaniya i obryady v Sredney Azii., M.
8. Lobacheva NP (1978) K istorii slozheniya instituta svadebnoy obryadnosti (na primere kompleksov svadebnyh obychaev i obryadov narodov Sredney Azii i Kazahstana). // Sem'ya i semeynye obryady u narodov Sredney Azii i Kazahstana., M..
9. Lobacheva NP (1981) Svadebnyy obryad kak istoriko-etnograficheskiy istochnik. Na primere horezmskih uzbekov // SE, 1981, № 2.
10. Jabborov I (2004) O`zbeklar an`anaviy turmushi va madaniyati, T.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	ПИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](http://s-o-i.org/1.1/TAS) DOI: [10.15863/TAS](https://dx.doi.org/10.15863/TAS)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 30.04.2017 <http://T-Science.org>

Kamoliddin Mirzaahmedov

Senior teacher

Department of Theory and Practice of Democratic

State Construction

Faculty of social sciences

National University of Uzbekistan

Tashkent, Uzbekistan

SECTION 22. Policy. Innovations. Theory, practice and methods.

THEORY AND MECHANISMS OF MODERN PUBLIC ADMINISTRATION

Abstract: This article is devoted to the activity of offices in the system of state governing, their structure, the role and place in organization of state governing, as well as the problems connected with organizing of offices in the accordance with the structure of state building are considered.

Key words: tradition, mechanism, functions of state management, democracy, the system of management of the state, administrative reform, national benefit, political and legal institution, state decision, executive authority, social institution.

Language: Russian

Citation: Mirzaahmedov K (2017) THEORY AND MECHANISMS OF MODERN PUBLIC ADMINISTRATION. ISJ Theoretical & Applied Science, 04 (48): 90-93.

Soi: <http://s-o-i.org/1.1/TAS-04-48-16> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.16>

ТЕОРИЯ И МЕХАНИЗМЫ СОВРЕМЕННОГО ГОСУДАРСТВЕННОГО УПРАВЛЕНИЯ

Аннотация: В данной статье представлена деятельность учреждений в системе государственного управления, их структура, роль и место в организации государственного управления, а также затронуты проблемы связанные с организацией учреждений в соответствии со структурой государственного строительства.

Ключевые слова: традиция, аппарат, функции государственного управления, демократия, государственная система управления, административная реформа, национальная польза, исполнительная власть, правовое государство, государственное решение, социальный институт.

Introduction

За последние несколько десятилетий во многих странах мира проведены крупномасштабные реформы, направленные на повышение эффективности государственного управления. Большинство современных проблем социально-экономического развития в значительной степени связано с реализацией принятых органами государственной власти экономических, социальных и политических решений, направленных на дальнейшее улучшение социально-экономической ситуации в стране, обеспечение национальной безопасности. Это связано с:

□ изменением статуса и функций государственной службы, качественно иным уровнем «открытости» органов государственной власти;

□ появлением новых форм взаимодействия законодательной и исполнительной власти;

□ переориентацией государственной службы на нужды граждан, отстаиванием их потребностей и интересов, корректированием в соответствии с этим планов, программ и проектов собственной деятельности;

□ обеспечением равновесия между государственными и корпоративными интересами;

□ демократическим контролем над функционированием системы административного управления;

□ процессами децентрализации управления, делегирования функций и ответственности снизу и др.



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	ПИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

Materials and Methods

Государственное управление - это целенаправленное организующее воздействие государства (через систему ее органов и должностных лиц) на общественные процессы, отношения и деятельность людей. В государственном управлении используются разнообразные материальные, финансовые, интеллектуальные и информационные ресурсы. Процесс государственного управления состоит из множества управленческих решений и действий и рассматривается как система. Система, по определению А.В.Пикулькина, - это множество элементов, частей, подсистем, которые образуют целостность, единство [1].

А по утверждению Н.И.Глазуновой, «без свойств системности госуправление не может состояться. В нем задействовано множество государственных органов и общественных структур, большое число должностных лиц и иных служащих, миллионы людей. И только системность может придать государственному управлению согласованность, координацию, субординацию, целеустремленность, рациональность, эффективность» [2].

Системный характер государственного управления заключается в обеспечении единства распорядительного (командно-административного) и партнерского (социально-консолидированного) начал в практике регулирования социальных отношений и процессов [3].

Из анализа существующих точек зрения на систему государственного управления следует ее определение: это определенная совокупность иерархически связанных между собой органов политической власти и управления, во взаимодействии реализующих управление государственной сферой экономики и социальной жизни и обеспечивающих исполнение законов, конституционно установленных прав и свобод граждан.

Современная концепция государственного управления концентрирует внимание на политическом плюрализме в процессе принятия решений, делегировании полномочий на нижние уровни управленческой иерархии, более сбалансированном распределении власти, ответственности и подотчетности, развитии и расширении гражданского участия. Данная концепция предусматривает децентрализацию управления за счет расширения полномочий и ответственности органов местного самоуправления. Основная задача правительства заключается в том, чтобы предоставить местным сообществам возможность самостоятельно решать свои проблемы и контролировать качество предоставляемых публичных услуг.

Основополагающим в государственном управлении является уяснение роли и места человека и общества как объектов управления. Всякое управление проявляется во взаимодействии субъекта и объекта управления. Интенсивность прямой и обратной связи зависит от вида и характера субъекта и объекта управления. По этому критерию можно различать демократический и авторитарный характер государственного управления. Если преобладают прямые связи управления (командная информация), а механизм обратной связи слабо развит или практически блокирован, - можно говорить об авторитарном управлении. Если механизм обратной связи хорошо развит наряду с прямой, - можно говорить о демократическом управлении.

Опыт реформ государственного управления в европейских странах показывает, что пределы децентрализации обусловлены спецификой отношений и потенциалом местного самоуправления. Политическая децентрализация и коммерциализация публичных услуг в Англии, повышение роли коммун и постепенный переход к рыночным отношениям в управлении Германии, административные реформы и активизация местных сообществ во Франции - все эти процессы отражают ту или иную модель децентрализации, на которые ориентируются другие европейские страны [4].

По характеру взаимоотношений центра (центральных органов власти) и регионов (органов власти национально-территориальных и административно-территориальных единиц) различают субординационное и координационное управление.

Координационное управление реализуется в форме федерации или конфедерации, когда наряду с едиными центральными органами власти существуют и периферийные, обладающие полной или частичной самостоятельностью.

Субординационное управление базируется на административном подчинении периферии центру, воздействию на нижестоящие органы управления, принуждении к выполнению команд, поступающих из вышестоящих органов управления, что характерно для унитарных государств.

По критерию использования форм собственности выделяют: региональное (субъектно-федеральное), муниципальное и частное (корпоративное) управление. По воздействию на управляемый объект выделяют отраслевое (функциональное) и территориальное управление.

Отраслевое управление предполагает наличие вертикали соподчиненности от центра до предприятия. Оно реализуется через отраслевые

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	ПИИЦ (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

министерства, которые осуществляют единую техническую политику в отрасли, обеспечивают необходимые внутриотраслевые и межотраслевые пропорции. При переходе к постиндустриальному развитию отмечается снижение роли отраслевого управления, так как развитие высоких технологий требует межотраслевого управления.

Территориальное управление направлено на рациональное размещение производства, углубление специализации и комплексное развитие регионов, выравнивание уровней их экономического и социального развития. Оно обеспечивается разграничением объемов полномочий между федеральными, региональными и местными органами власти.

В зависимости от масштаба временных рамок управление подразделяется на стратегическое, тактическое и оперативное.

Стратегическое управление - определяет долгосрочную ориентацию по вопросам развития общества в целом или по отдельным направлениям, сферам, объектам, территориям, намечает цели, задачи, стратегию развития общества и задает направление деятельности каждому звену управления. Основой стратегического управления являются стратегические планы, концепции развития и другие документы, отражающие постановку и методы достижения долгосрочных целей.

Различают стратегии *отраслевые*: развитие наукоемких отраслей, использование ресурсосберегающих технологий; *функциональные*: подавление инфляции, привлечение инвестиций; *общеполитические*: стабилизация, перестройка, социально-ориентированная политика и др.

Тактическое управление - конкретные действия по реализации намеченных целей. Это краткосрочное управление, при котором на базе имеющейся информации происходит постоянное сравнение показателей стратегического плана с достигнутыми результатами за определенный период. Иногда происходит корректировка некоторых показателей стратегического плана, пересматриваются какие-либо цели, если выявляется действие ранее неучтенных факторов.

Оперативное управление - призвано решать текущие или возникающие в результате нежелательных отклонений задачи. При этом ставятся конкретные, количественно измеряемые ориентиры и используется ситуационный подход, при котором выбирается приемлемый вариант исходя из сложившихся условий.

Выделяют также такой специфический вид ситуационного управления, как антикризисное управление - вводится для предупреждения и проведения процедуры банкротства предприятий;

является принудительным и внешним, так как осуществляется органами, входящими в иную чем предприятие систему, включает управление через арбитражных и конкурсных управляющих, а также управляющих предприятиями-должниками по договору подряда.

Для сохранения конкурентоспособности предприятий иногда вводится доверительное управление, которое предполагает отделение функций владения от функций управления, осуществляется лицами по договору с органами государственного управления, трансформируется в профессиональное управление через специальных управляющих. Отношения с государством строятся не на властном подчинении, а на формальном равенстве сторон на основе договора [5].

Таким образом, система государственного управления весьма ограничена, ее элементы многомерны, многообразны, способны к саморазвитию, являются частью целого.

Conclusion

В заключении можно сказать, что понятия государство и общество взаимосвязаны. Потому что, социальная жизнь людей обладает обширной свободой и самоуправлением. Эта граница социальной свободы определяется социальными институтами и государством. То есть, государство принимая законы во всех сферах жизни людей основывает моральные, правовые нормы и обеспечивает контроль над ними. Это состояние, оценивается как «распространение государственного управления в обществе». Механизм управления не сводится только к набору методов и рычагов управленческого воздействия на социально-экономические процессы. Управленческое воздействие составляет лишь одну сторону механизма управления. Главное же содержание его определяется целевым предназначением системы, целевыми функциями каждого элемента и его взаимодействиями с другими элементами системы государственного управления. Основываясь на государственное управление, понятие госуправления, на его составляющие элементы, государственные органы, на свойства госорганов, на принцип разделения власти как организационный принцип организации работы государственного аппарата и на действие этого принципа, а также, на плодотворное действие государственного управления, нужно подчеркнуть, что государственное управление, как главный субъект социально-экономических, политических и духовных изменений прогресса общества меняется структурально и функционально.

Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

References:

1. Pikul'kin AV (2000) Sistema gosudarstvennogo upravleniya: Uchebnik dlya vuzov.-2-e izd., pererab. i dop. M.: YUNITI-DANA.
2. Glazunova NI (2001) Gosudarstvennoe upravlenie kak sistema. GGU. M..
3. Mitin AN, Rassohin AV (2008) Sistemnye osnovy gosudarstvennogo i municipal'nogo upravleniya. Ekaterinburg: ID UrGYUA.
4. (2016) [Elektronnyy resurs]. k.eh.n. Rahmetulina Z.B. i mag. Ual'hanov O.E. "Sovremennye koncepcii gosudarstvennogo upravleniya", Vostochno-Kazahstanskiy gosudarstvennyy universitet im. S.Amanzholova, Kazahstan. Available: <http://www.konspekt.biz/index.php?text=4232> (Accessed: 01.12.2016).
5. Naumov SY, et al. (2008) «Sistema gosudarstvennogo upravleniya» - M.: «Forum».
6. Matyash SA (2014) Informacionnye tekhnologii upravleniya: kurs lekciy. – M.: Direkt-Media. – 537 p.
7. (2014) Pravo i pravoprimenenie v zerkale social'nyh nauk : hrestomatiya sovremennyh tekstov. – M.: Statut. – 568 p.
8. Lapaeva MG, Lapaev SP, Kuzaeva TV (2015) Teorii prostranstvennogo i regional'nogo razvitiya: uchebnoe posobie. Orenburg: OGU. – 141 p.
9. Moiseev VV (2015) Sistema gosudarstvennogo i municipal'nogo upravleniya: uchebnoe posobie. – M.: Direkt-Media. – 603 p.
10. Baynova MS, Medvedeva NV, Ryazanceva YS (2016) Osnovy gosudarstvennogo i municipal'nogo upravleniya: uchebnoe posobie. – M.: Direkt-Media. – 459 p.



Impact Factor:

ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
ISI (Dubai, UAE) = 0.829	PIHHI (Russia) = 0.234	PIF (India) = 1.940
GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	



Impact Factor:	ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 0.829	PIIHQ (Russia) = 0.234	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 2.031	

Contents

	pp.
1. Ameneh H A CONFIRMATORY SURVEY OF DIFFERENTIAL ITEM FUNCTIONING.	1-7
2. Jakiyayev D, Zhunisbekov S, Jakiyayev B THE PREDICTION OF DURABILITY OF STEEL STRUCTURAL ELEMENTS IN COMPLEX HETEROGENEOUS STRESS STATE.	8-14
3. Chemezov D, Kiseleva E ENERGY AUDIT SYSTEM AT THE JSC ZAVOD AVTOPRIBOR.VLADIMIR, RUSSIA.	15-18
4. Saidalieva M, Hidirova MB MATHEMATICAL MODELING REGULATORY MECHANISMS OF HEPATITIS B VIRUSES'S MICRO-RNA ACTION.	19-23
5. Nowakowski W NETWORK MANAGEMENT SOFTWARE FOR REDUNDANT ETHERNET RING.	24-29
6. Aliyev ST, Israilova SJ THE PROBLEMS AND WAYS OF DEVELOPMENT OF TOURISM SECTOR IN AZERBAIJAN.	30-35
7. Ajenikoko GA, Salami OA DEVELOPMENT OF A GENERALIZED TWO-PARAMETER TEMPERATURE BASED LINEAR MODEL FOR ASSESSMENT OF SOLAR IRRADIANCE ON NIGERIAN GEO- POLITICAL ZONES.	36-48
8. Ajenikoko GA, Agboibon WO THE RISKS AND CHALLENGES AFFECTING THE IMPLEMENTATION OF NUCLEAR ENERGY FOR ELECTRICAL POWER GENERATION IN NIGERIA.	49-56
9. Naimeh A COMPUTER-ASSISTED LANGUAGE LEARNING: THE EFFECT OF CALL ON IRANIAN EFL LEARNERS WRITING PERFORMANCE.	57-63
10. Shevchenko GG, Gura DA, Muranov ID, Bahtarova EN PROVIDING HIGH-PRECISION MEASUREMENTS BY ELECTRONIC TACHEOMETERS.	64-69
11. Goloperov IV, Belova EA, Baklanov AN, Baklanova LV SOLVING THE PROBLEMS OF SAFETY IN THE PRODUCTION OF IODIED SALT.	70-75
12. Huseinov MJ, Amrahov VT ABOUT ACADEMIC ISSUES OF NECESSARY FACTORS FOR DIVERSIFICATION OF PRODUCTION IN AGRARIAN SECTOR.	76-78
13. Aymatov AQ SOME ASPECTS OF THE RELATIONSHIP BETWEEN ENVIRONMENTAL CONSCIOUSNESS AND AESTHETIC PERCEPTION OF THE ENVIRONMENT.	79-82
14. G`aybullaev OM SOME ASPECTS AND HISTORICAL FACTORS OF INTEGRATION PROCESSES IN SPHERE OF GLOBALIZATION OF THE ECOLOGICAL POLICY.	83-86

Impact Factor:	ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 0.829	PIHII (Russia) = 0.234	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 2.031	

15. **Komilov RR**
AESTHETIC COMPONENT OF WEDDING CEREMONIES OF THE UZBEK PEOPLE. 87-89
16. **Mirzaahmedov K**
THEORY AND MECHANISMS OF MODERN PUBLIC ADMINISTRATION. 90-93



Impact Factor:	ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 0.829	ПИИЦ (Russia) = 0.234	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 2.031	



Scientific publication

«Theoretical & Applied Science» - Международный научный журнал зарегистрированный во Франции, и выходящий в формате Международных научно-практических интернет конференций. Конференции проводятся ежемесячно – 30 числа в разных городах и странах.

Препринт журнала публикуется на сайте за день до конференции. Все желающие могут участвовать в "Обмене мнениями" по представленным статьям.

Все поданные авторами статьи в течении 1-го дня размещаются на сайте <http://T-Science.org>. Печатный экземпляр рассылается авторам в течение 2-4 дней, сразу после проведения конференции.

Импакт фактор журнала

Impact Factor	2013	2014	2015	2016
Impact Factor JIF		1.500		
Impact Factor ISRA (India)		1.344		
Impact Factor ISI (Dubai, UAE) based on International Citation Report (ICR)	0.307	0.829		
Impact Factor GIF (Australia)	0.356	0.453	0.564	
Impact Factor SIS (USA)	0.438	0.912		
Impact Factor ПИИЦ (Russia)		0.179	0.234	
Impact Factor ESJI (KZ) based on Eurasian Citation Report (ECR)		1.042	1.950	3.860
Impact Factor SJIF (Morocco)		2.031		
Impact Factor ICV (Poland)		6.630		
Impact Factor PIF (India)		1.619	1.940	
Impact Factor IBI (India)			4.260	

Impact Factor:	ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 0.829	ПИИЦ (Russia) = 0.234	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 2.031	

THE SCIENTIFIC JOURNAL IS INDEXED IN SCIENTOMETRIC BASES:



International Scientific Indexing ISI (Dubai, UAE)
<http://isindexing.com/isi/journaldetails.php?id=327>



Research Bible (Japan)
<http://journalseeker.researchbib.com/?action=viewJournalDetails&issn=23084944&uid=rd1775>



ПИИЦ (Russia)
<http://elibrary.ru/contents.asp?issueid=1246197>



Türk Eğitim İndeksi (Turkey)
<http://www.turkegitimindeksi.com/Journals.aspx?ID=149>



Advanced Sciences Index (Germany)
<http://journal-index.org/>



Global Impact Factor (Australia)
<http://globalimpactfactor.com/?type=issn&s=2308-4944&submit=Submit>



AcademicKeys (Connecticut, USA)
http://sciences.academickeys.com/jour_main.php



THOMSON REUTERS

Indexed in Thomson Reuters

THOMSON REUTERS, EndNote (USA)
<https://www.myendnoteweb.com/EndNoteWeb.html>



Scientific Object Identifier (SOI)
<http://s-o-i.org/>



Google Scholar (USA)
http://scholar.google.ru/scholar?q=Theoretical+science.org&btnG=&hl=ru&as_sdt=0%2C5



Open Access JOURNALS

Open Access Journals
<http://www.oajournals.info/>



SCIENTIFIC INDEXING SERVICE (USA)
<http://sindexs.org/JournalList.aspx?ID=202>



International Society for Research Activity (India)
<http://www.israjif.org/single.php?did=2308-4944>



Sherpa Romeo (United Kingdom)
<http://www.sherpa.ac.uk/romeo/search.php?source=journal&sourceid=28772>



Impact Factor:

ISRA (India) = 1.344
ISI (Dubai, UAE) = 0.829
GIF (Australia) = 0.564
JIF = 1.500

SIS (USA) = 0.912
PIHII (Russia) = 0.234
ESJI (KZ) = 3.860
SJIF (Morocco) = 2.031

ICV (Poland) = 6.630
PIF (India) = 1.940
IBI (India) = 4.260



CiteFactor

Academic Scientific Journals

CiteFactor (USA) Directory Indexing of International Research Journals

<http://www.citefactor.org/journal/index/11362/theoretical-applied-science>



International Institute of Organized Research (India)

<http://www.i2or.com/indexed-journals.html>



DOI (USA)

<http://www.doi.org>



CrossRef (USA)

<http://doi.crossref.org>



JIFACTOR

JIFACTOR

http://www.jifactor.org/journal_view.php?journal_id=2073



Journal Index

<http://journalindex.net/?qi=Theoretical+%26+Applied+Science>



Directory of abstract indexing for Journals

Directory of abstract indexing for Journals

<http://www.daij.org/journal-detail.php?jid=94>



PFTS Europe/Rebus:List (United Kingdom)

<http://www.rebuslist.com>



Kudos Innovations, Ltd. (USA)

<https://www.growkudos.com>



Korean Federation of Science and Technology Societies (Korea)

<http://www.kofst.or.kr>



Japan Link Center (Japan)

<https://japanlinkcenter.org>



Open Academic Journals Index (Russia)

<http://oaji.net/journal-detail.html?number=679>



Eurasian Scientific Journal Index (Kazakhstan)

<http://esjindex.org/search.php?id=1>



Collective IP (USA)

<https://www.collectiveip.com/>



Impact Factor:

ISRA (India) = 1.344
ISI (Dubai, UAE) = 0.829
GIF (Australia) = 0.564
JIF = 1.500

SIS (USA) = 0.912
ПИИИ (Russia) = 0.234
ESJI (KZ) = 3.860
SJIF (Morocco) = 2.031

ICV (Poland) = 6.630
PIF (India) = 1.940
IBI (India) = 4.260



THOMSON REUTERS

Indexed in Thomson Reuters

THOMSON REUTERS, ResearcherID (USA)

<http://www.researcherid.com/rid/N-7988-2013>



Stratified Medical

Stratified Medical Ltd. (London, United Kingdom)

<http://www.stratifiedmedical.com/>



SJIF Impact Factor (Morocco)

<http://sjifactor.inno-space.net/passport.php?id=18062>



InfoBase Index (India)

<http://infobaseindex.com>

RedLink

RedLink (Canada)

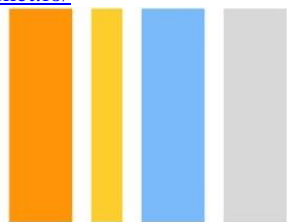
<https://www.redlink.com/>

TDNet
simply better

TDNet

Library & Information Center Solutions (USA)

<http://www.tdnet.io/>



RefME

RefME (USA & UK)

<https://www.refme.com>

ALL SUBMISSIONS SCREENED BY:



WANT TO PRE-CHECK YOUR WORK? >>



Indian Citation Index

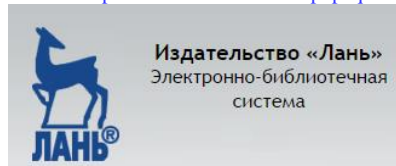
Indian citation index (India)

<http://www.indiancitationindex.com/>

INDEX COPERNICUS
INTERNATIONAL

Index Copernicus International (Warsaw, Poland)

<http://journals.indexcopernicus.com/masterlist.php?q=2308-4944>



Электронно-библиотечная система

«Издательства «Лань» (Russia)

<http://e.lanbook.com/journal/>

ORCID

THOMSON REUTERS, ORCID (USA)

<http://orcid.org/0000-0002-7689-4157>



Yewno (USA & UK)

<http://yewno.com/>



Impact Factor:	ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 0.829	PIIHQ (Russia) = 0.234	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 2.031	



Impact Factor:	ISRA (India) = 1.344	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 0.829	PIIHQ (Russia) = 0.234	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 3.860	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 2.031	

Signed in print: 30.04.2017. Size 60x84 $\frac{1}{8}$

«**Theoretical & Applied Science**» (USA, Sweden, KZ)
Scientific publication, p.sh. 14.5. Edition of 90 copies.
<http://T-Science.org> E-mail: T-Science@mail.ru

Printed «Theoretical & Applied Science»

