

Vol 5. (1), 1-13

ISSN:

URR: www.queenscollege.edu.et

Email: info@queenscollege,net

# Queens' Journal of Interdisciplinary **Research and Development**

# Full Length Research Paper

The Effect of Leadership Behavior on Employee Job Satisfaction: In The Case of Ethiopian Road Authority Employees, Head Office, Addis Ababa, Ethiopia

> Tadese Legesse<sup>1</sup> <sup>1</sup>Queens College, Addis Ababa, Ethiopia

#### **Article Info**

#### **Abstract**

#### **Article History**

Received: 8 April 2022

# Keywords:

leadership behavior, job satisfaction, Ethiopian roads Authority

This study investigated the impact of leadership behavior on employee job satisfaction at the Ethiopian Roads Authority (ERA) headquarters, based on path-goal leadership theory. Using an Publshed: Auguest 2022 explanatory research design and a quantitative approach, the researchers collected primary data through structured questionnaires and secondary data from previous studies, journals, and books. A stratified random sampling method was employed to survey 254 professional employees across 22 directorates at the Addis Ababa headquarters. The data was analyzed using SPSS software, including descriptive statistics and multiple regression analysis. The results showed that achievement-oriented leadership behavior had a positive and significant effect on job satisfaction, while participative and directive behaviors did not significantly impact job satisfaction. Supportive leadership was the most dominant behavior observed, but achievement-oriented leadership was found to contribute more to job satisfaction. The researcher recommend that the company should focus on practicing achievement-oriented leadership, which has a significant positive effect on employee job satisfaction. The company should also regularly conduct job satisfaction surveys and take corrective actions to address areas needing improvement.

Licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.



## 1. Introduction

Organizations strive to maintain a competitive edge, which depends on the effective utilization

of their resources, including physical, financial, and human. Human resources are considered the most vital asset, as they enable the exploitation of other resources (Lee and Ahmad, 2009).

\* Corresponding Email: sestadesse@gmail.com

Employee satisfaction is crucial to business success, as high contentment levels directly correlate with lower turnover and higher productivity.

Therefore, keeping employees satisfied should be a priority for employers (Landy, 1989). Factors such as leadership play a central role in determining job satisfaction (Bass, 1990).

Leadership behavior, defined as the pattern of behavior leaders prefer to use (Chiok, 2001), can have a direct impact on the superior-subordinate relationship, affecting performance, job satisfaction, commitment, and organizational coherence (Wilderom, Berg & Peter, 2004). The path-goal leadership theory categorizes leadership behavior into four types: directive, supportive, participative, and achievement-oriented (Mosadeghrad and Yarmohammadian, 2006).

This study aims to identify the effect of leadership behavior on employee job satisfaction at the Ethiopian Roads Authority headquarters in Addis Ababa, Ethiopia, based on the path-goal leadership theory.

The central problem this study addresses is that in many Ethiopian organizations, work is task-focused and routine, with decisions and policies imposed on employees, who then merely pretend to perform well. However, the achievement of organizational objectives largely depends on the leadership behavior of managers, which can affect both job satisfaction and productivity (Chiok, 2001).

According to the path-goal leadership theory, leaders can exhibit different types of behavior: task-oriented or human relations-oriented (Fiedler, 1967). Recent internal data from the Ethiopian Roads Authority (ERA) suggests a decrease in employee job satisfaction, and informal interviews indicate issues with leadership behav-

iors, such as unreasonable demands, lack of communication, and decision-making problems. However, the Authority's leadership believes employees are satisfied, and no empirical research has been conducted on the impact of leadership behavior on job satisfaction in the ERA.

Therefore, this study aims to assess the effect of four key leadership behaviors (directive, supportive, participative, and achievement-oriented) on employee job satisfaction in the Ethiopian Roads Authority.

The specific research questions are:

- 1) What is the effect of directive leadership behavior on job satisfaction of ERA employees?
- 2) How does supportive leadership behavior affect job satisfaction of ERA employees?
- 3) What is the effect of participative leadership behavior on job satisfaction of ERA employees?
- 4) What is the effect of achievement-oriented leadership behavior on job satisfaction of ERA employees?

#### The study hypotheses are:

H1: Directive leadership behavior has a significant effect on employee job satisfaction.

H2: Supportive leadership behavior has a significant effect on employee job satisfaction.

H3: Participative leadership behavior has a significant effect on employee job satisfaction.

H4: Achievement-oriented leadership behavior has a significant effect on employee job satisfaction.

## 2. Litrature review

#### 2.1 Job Satisfaction

Job satisfaction has been defined in various ways by researchers. Spector (1997) refers to it as how people think about their job and different aspects of it. Ellickson and Logsdon (2002) define it as the extent to which employees like their work. At its core, job satisfaction involves the emotional, sentimental, or affective attitudes employees have towards their job.

The most widely accepted conceptualization of job satisfaction was presented by Locke (1976), who defined it as "a pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences" (Locke, 1976, p.1304). This suggests that job satisfaction has emotional, cognitive, and behavioral components. The emotional component refers to the feelings employees have about their job, such as boredom, anxiety, or excitement.

Moreover, job satisfaction is a complex, multidimensional construct that encompasses how employees think, feel, and behave in relation to their work. The definitions provided by Spector, Ellickson and Logsdon, and Locke capture the attitudinal and emotional nature of this important organizational variable.



Figure 1.Job Satisfaction Model (Field, 2008).

#### 2.2 Theories of Job Satisfaction

Theories of job satisfaction share significant overlap with broader theories of human motivation. The most prominent and widely-studied models in this domain include: Maslow's hierarchy of needs theory, Herzberg's two-factor (motivator-hygiene) theory, the Job Characteristics Model, and the dispositional approach.

#### 2.2.1 Herzberg's Two-Factor Theory

Herzberg's (1957) two-factor theory proposes that satisfaction and dissatisfaction are driven by distinct sets of factors. Hygiene factors, such as company policies, compensation, benefits, and working conditions, must first be addressed to prevent dissatisfaction. Motivator factors, including responsibility, achievement, esteem, and autonomy, then serve to actively promote job satisfaction by meeting higher-order psychological needs. According to Herzberg, intrinsic job content factors are the primary drivers of job satisfaction.

## 2.2.2 Maslow's Hierarchy of Needs

Maslow's classic hierarchy of needs theory suggests that human needs form a tiered structure, with more basic physiological and safety needs at the bottom, followed by belongingness, esteem, and finally self-actualization needs at the apex. The theory posits that lower-level needs must be reasonably satisfied before individuals are motivated to fulfill higher-order needs. In the work context, this implies that organizations should first ensure employees' basic needs are met before attempting to address higher-level needs to enhance job satisfaction.

Morever, prominent theories of job satisfaction emphasize the importance of considering both extrinsic hygiene factors and intrinsic motivator factors, as well as the hierarchical nature of human needs, when seeking to understand and improve employee job satisfaction.



Figure 2: Maslow's Five-level hierarchy (1943)

# 2.3 Theorethical Foundation of the Study

The theoretical framework for this study conceptualizes job satisfaction as the dependent variable, with various leadership behaviors serving as the independent variables. In developing this conceptual model, the researchers have drawn upon multiple established theories and frameworks.

The foundational theory underpinning this work is the path-goal theory of leadership, proposed by House (1971), Northouse (2013), and House and Mitchell (1974). Path-goal theory is a contingency approach that defines leadership effectiveness in terms of the leader's ability to provide their subordinates with the necessary information and support to achieve valued rewards and goals.

Specifically, the path-goal theory identifies four key leadership behaviors:

- Supportive (relations-oriented)
- Directive (task-oriented)
- Achievement-oriented
- Participative

These four leadership behaviors are theorized to

have differential impacts on employee job satisfaction, which is a central focus of the study.

Additionally, in examining job satisfaction, the researchers have incorporated elements of Herzberg's two-factor theory of motivation and hygiene. This suggests that both intrinsic motivator factors and extrinsic hygiene factors should be considered when evaluating employee job satisfaction.

Overall, the theoretical framework integrates prominent leadership and job satisfaction theories to develop a comprehensive model for investigating the relationships between specific leadership behaviors and employee job satisfaction.

# 3. Materials and methods

The study utilized various descriptive data analysis techniques to conduct the central analysis, including measures of central tendency (mean), frequency distributions, and measures of dispersion. All statistical analyses were performed using SPSS version 20.

In addition to the descriptive analyses, the study employed correlation and multiple regression analysis to examine the relationships between job satisfaction and leadership behaviors.

Multiple regression analysis allows for the modeling of a dependent variable (in this case, job satisfaction) as a linear function of two or more independent/predictor variables (the leadership behaviors). The general multiple regression equation takes the form:

$$Y = b0 + b1X1 + b2X2 + ... + bkXk + \varepsilon$$

Where:

Y = the dependent variable (job satisfaction)

b0 = the constant/intercept term

b1, b2, ..., bk = the regression coefficients for the independent variables X1, X2, ..., Xk

 $\varepsilon$  = the error term

Correlation analysis was used to first assess the strength and significance of the bivariate relationships between the independent leadership behavior variables and the dependent job satisfaction variable.

The regression analysis then allowed the researchers to quantify the extent to which the selected leadership behaviors explain variance in the job satisfaction outcome variable. This provided insights into the relative impact of different leadership behaviors on employee job satisfaction.

## 4. Results and Discussion

### 4.1 Assumption tests

The researchers conducted multiple regression analysis to quantify the extent to which the selected leadership behaviors explained variance in the dependent job satisfaction variable. Prior to estimating the regression models, the researchers assessed the data for potential issues of multicollinearity among the independent variables. Multicollinearity can be problematic as it indicates high intercorrelations between the predictor variables, which can impact the stability and interpretation of the regression coefficients.

The researcher evaluated multicollinearity using two common diagnostic metrics - variance inflation factor (VIF) and tolerance. As a rule of thumb, a VIF value exceeding 10 is often considered to indicate serious multicollinearity concerns, while a tolerance value less than 0.1 is also suggestive of problematic collinearity. In the current study, the VIF values for the leadership behavior variables ranged from 1.655 to 2.944, and the corresponding tolerance values ranged from 0.340 to 0.604 (see Table 1). Based on these results, the researcher concluded that multicollinearity was not a concern in this analysis, as all VIF values were well below 10 and all tolerance values exceeded 0.1, indicating the independent variables were not highly correlated with one another.

With the assumption of minimal multicollinearity satisfied, the researchers proceeded to estimate the multiple regression model to examine the predictive relationships between the leadership behaviors and job satisfaction. The specific regression results and their interpretation are presented in the following sections.

As Tabke 2 reveals the normality using descriptive statistics. Examining the skewness values offers insights into the symmetry of the distributions. The skewness values for Directive LB, Participatory L, and Job Satisfaction are close to 0, suggesting relatively symmetric distributions. The Supportive LB variable exhibits a slightly negative skewness, indicating a distribution with a longer left tail, while the Achievement OL variable shows a positive skewness, implying a distribution with a longer right tail.

Regarding kurtosis, the values for all the variables are close to 0, indicating relatively mesokurtic (normal) distributions. The Job Satisfaction

variable demonstrates a slightly platykurtic (flatter) distribution, with a kurtosis value slightly below 0.

Morever, the skewness and kurtosis values suggest that the variables generally have a relatively normal distribution, with only minor deviations from the ideal. This supports the assumption of

normality, which is crucial for the validity of the subsequent statistical analyses conducted in the study. The careful examination of these distributional characteristics enhances the credibility of the research findings and the conclusions drawn from the data.

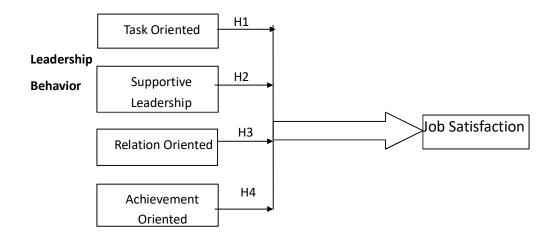


Figure 1:- Cconceptual framework (Northouse, 2013).

Table 1: Result of Multi co linearity test

Model		Collinearity Statistics		
		Tolerance	VIF	
1	(Constant)			
	Directive Leadership behaviours	.604	1.655	
	Supportive Leadership behaviours	.472	2.119	
	Participatory Leadership behaviours	.577	1.734	
	Achievement Oriented	.340	2.944	

a. Dependent Variable: JOB SATISFACTION Source: own survey 2022

Table 2: Descriptive Statistics of Normality Test

Variables	N	Skewness		Skewness		li	Kurtosis
	Statistic	Statistic	Std. Error	Statistic	Std. Error		
Directive Leadership behaviours	254	199	.153	624	.304		

Supportive Leadership behaviours	254	767	.153	.635	.304
Participatory Leadership behaviours	254	191	.153	.850	.304
Achievement Oriented	254	.599	.153	278	.304
JOB	254	079	.153	-1.165	.304
SATISFACTION					
Valid N (listwise)	254				

# 4.2 Regression analysis

As Table 3, shows the relationship between the independent variables (Directive LB, Supportive LB, Participatory L, and Achievement OL) and the dependent variable (Total Job Satisfaction). The table shows that there is a single regression model, with an R value of 0.442. This multiple correlation coefficient indicates a moderate strength of the linear relationship between the independent variables and the dependent variable. The R Square value of 0.195 suggests that the independent variables included in the model account for approximately 19.5% of the total variation in the dependent variable, Total Job Satisfaction.

The Adjusted R Square value of 0.182 provides a more conservative estimate of the explained variance, taking into account the number of independent variables in the model. This means that the model explains approximately 18.2% of the variability in the dependent variable, after adjusting for the number of predictors. The Std. Error of the Estimate is 0.68323, which represents the standard deviation of the residuals, or the average amount of error in the predictions made by the

regression model. This relatively small value indicates a good fit of the model to the data and suggests that the predictions made by the model have a relatively low level of error.

Morever, the model summary table suggests that the multiple regression model has a moderate level of explanatory power, with the independent variables accounting for a substantial portion of the variance in the dependent variable, Job Satisfaction. These findings provide insights into the strength of the relationship between the leadership styles and employee job satisfaction, as well as the overall fit and reliability of the regression model used in the study.

The ANOVA table (4) presented in the study provides a statistical evaluation of the overall fitness and significance of the multiple regression model used to examine the relationship between the independent variables (Directive LB, Supportive LB, Participatory L, and Achievement OL) and the dependent variable (Job Satisfaction).

The table shows that the regression model is statistically significant, with an F-statistic of 15.0 and a corresponding p-value (Sig.) of 0.000, which is less than the commonly used significance level of 0.05. This indicates that at least one of the independent variables is a significant

predictor of the dependent variable, Job Satisfaction.

The sum of squares values in the table further support the model's overall fitness. The regression sum of squares is 28.142, which represents the variation in Job Satisfaction that is explained by the independent variables. The residual sum of squares is 72.0, which represents the variation in Job Satisfaction that is not accounted for by the model. The total sum of squares, which is the sum of the regression and residual sums of squares, is 116.233.

The degrees of freedom (Df) values in the table provide information about the number of parameters in the model. The regression model has 4 degrees of freedom, corresponding to the 4 independent variables included in the analysis. The total degrees of freedom is 249, which is the

number of observations minus 1.

The mean square values, calculated by dividing the sum of squares by the respective degrees of freedom, further support the statistical significance of the regression model. The regression mean square of 7.036 is substantially larger than the residual mean square, leading to the high F-statistic value.

Overall, the ANOVA table indicates that the multiple regression model used in the study has a good overall fit and is statistically significant, suggesting that the independent variables collectively have a meaningful impact on the dependent variable, Job Satisfaction. These findings provide a strong foundation for the subsequent interpretation and discussion of the specific relationships between the variables.

Table 3 Model Summary

Model	R R Square Ad		Adjusted R Square	Std. Error of the Estimate		
1	.442ª	.195	.182	.68323		

Predictors: (Constant), AOL, PL, DLB, SLB. Dependent Variable: JOB SATISFACTION

**Table 4: Model Fitness** 

ANOVA <sup>a</sup>								
Model		Sum of Squares	Df	Mean Square	F	Sig.		
	Regression	28.142	4	7.036	15.0	.000b		
1	Residual	72						
	Total	116.233	249	.467				
a. Dependent Variable: Job Satisfaction								
b. Predictors: (Constant), AOL, PL, DLB, SLB								

**Table 5: Regression coefficients** 

Model		Unstandardized Coefficients		Standardized Coefficients				
·		В	Std. Error	Beta	t-value	Sig.		
	(Constant)	2.486	.477		5.214	.000		
	Directive Leadership behaviors	107	.090	087	-1.195	.233		
1	Supportive Leadership behav-	.192	.153	.104	1.254	.211		
1	iors							
	Participatory Leadership behav-	547	.132	309	-4.132	.000		
	iors							
	Achievement Oriented	.713	.131	.530	5.429	.000		
De	Dependent Variable: Job Satisfaction							

Source: Own survey, 2022

The regression coefficients table (5) presented in the study provides a detailed examination of the individual relationships between the independent variables (Directive Leadership behaviors, Supportive Leadership behaviors, Participatory Leadership behaviors, and Achievement Oriented) and the dependent variable, Job Satisfaction.

The unstandardized regression coefficients (B) offer insights into the direction and magnitude of the relationships. The constant (intercept) value of 2.486 represents the predicted level of Job Satisfaction when all the independent variables are equal to zero. The negative coefficient of -0.107 for Directive Leadership behaviors suggests an inverse relationship with Job Satisfaction, indicating that higher levels of Directive Leadership behaviors are associated with lower levels of Job Satisfaction. In contrast, the positive coefficients for Supportive Leadership behaviors (0.192) and Achievement Oriented (0.713) imply that these

variables have a positive influence on Job Satisfaction, such that higher levels are associated with increased Job Satisfaction.

The standardized regression coefficients (Beta) shed light on the relative importance of each independent variable in the model. The Beta value for Achievement Oriented (0.530) is the largest, suggesting that this variable has the strongest standardized effect on Job Satisfaction, followed by Participatory Leadership behaviors (-0.309). This indicates that a one-unit change in Achievement Oriented has a greater impact on Job Satisfaction compared to a one-unit change in the other independent variables.

The statistical significance of the relationships is evaluated using the t-values and corresponding p-values (Sig.). The p-values for Directive Leadership behaviors (0.233) and Supportive Leadership behaviors (0.211) are higher than the commonly used significance level of 0.05, indicating

that these variables are not statistically significant predictors of Job Satisfaction in the model. In contrast, the p-values for Participatory Leadership behaviors (0.000) and Achievement Oriented (0.000) are lower than 0.05, suggesting that these variables are statistically significant predictors of Job Satisfaction. This means that the relationships between these two independent variables and the dependent variables are unlikely to have occurred by chance.

Morever, the regression coefficients table provides valuable insights into the individual relationships between the leadership styles and employee job satisfaction. The findings highlight the importance of Participatory Leadership behaviors and Achievement Oriented as significant predictors of Job Satisfaction, while Directive Leadership behaviors and Supportive Leadership behaviors appear to have a less substantial impact on the dependent variable.

# 5. Conclusion and Implication

The results indicate a significant relationship between the various leadership behaviors (supportive, directive, participative, and achievement-oriented) and employee job satisfaction. This suggests that the leadership style adopted by the organization has a substantial impact on the level of job satisfaction experienced by the employees.

While the employees appear to be moderately satisfied with intrinsic factors such as the nature of their work, feelings of responsibility, and opportunities for growth and development, their satisfaction with extrinsic factors like salary, benefits, and promotion prospects is relatively low.

This could be due to the perception that other organizations in the industry offer more competitive compensation and benefits packages.

The regression analysis reveals that the dominant leadership behavior exhibited in the organization is participative in nature. However, the findings suggest that the employees' job satisfaction does not primarily depend on this participative leadership style. Instead, the leadership behavior that has a direct and significant impact on job satisfaction is the achievement-oriented approach.

Conversely, the employees appear to be dissatisfied with directive and participative leadership behaviors, as they tend to be more task-oriented rather than focused on employee relationships. Employees seem to prefer a more friendly and supportive work environment over one that is overly focused on strict rules and regulations.

The findings of this study can provide valuable feedback for the organizational leaders to understand how their leadership style is perceived by the employees and how this perception affects the employees' job satisfaction levels. Since organizational performance and effectiveness are closely tied to employee job satisfaction, it is crucial for the leaders to address these insights.

To enhance employee job satisfaction, the organization's leaders should focus on improving the quality of the achievement-oriented relationships between themselves and the employees. By emphasizing an achievement-oriented leadership approach, the organization can potentially increase the satisfaction and successful task completion of its employees, ultimately contributing to the achievement of the organization's goals and

objectives.

Based on the regression analysis and conclusions, the key recommendations are:

Leaders should focus on adopting an achievement-oriented leadership style, as this has been identified as the leadership behavior that has a direct and significant positive impact on employee job satisfaction. Fostering achievement-oriented relationships between leaders and employees can enhance the overall satisfaction levels.

Supportive leadership behaviors should also be emphasized, as they create a friendly and respectful work environment that caters to the well-being and needs of the employees, leading to increased job satisfaction.

The organization should minimize the participative leadership approach, as it was found to have a weak impact on employee job satisfaction in this context. The tasks performed by the employees are likely routine rather than complex, reducing the need for excessive participative decision-making.

Directive leadership behaviors should also be re-

#### **Conflict of Interests**

The authors declare that there's no conflict of interest concerning to the publication of this article.

### References

Rad, A. M. M., & Yarmohammadian, M. H. (2006). A study of relationship between managers' leadership style and employees' duced, as they were found to have a negative impact on employee job satisfaction. The nature of the work does not necessitate a high degree of directive supervision.

While directive and participative leadership may not have a significant direct effect on job satisfaction, the organization should ensure that employees have clear and understandable goals, as this can help motivate them and contribute to their overall performance.

The organization should assess and address the extrinsic factors, such as salary and benefits, to ensure they are competitive within the industry and meet the expectations of the employees, thereby enhancing their satisfaction with these aspects.

Periodic job satisfaction surveys should be conducted to identify areas for improvement, and appropriate corrective actions should be taken based on the findings.

Further research is recommended to explore the relationships between various leadership behaviors and their effects on job satisfaction in different organizational contexts

job satisfaction. Leadership in Health Services, 19(2), 11–28.

Ahmed, A., & Halim, A. (1982). Social support and managerial affective responses to job stress. Journal of Occupational Behavior, 3(4), 281–295.

Alanazi, A., Alharthey, B. K., & Rasli, A. (2013).

Overview of path-goal leadership theory.

Jurnal Teknologi (Social Sciences), 64(2),

49-53.

- Barusman, A. R. P., & Mihdar, F. (2014). The effect of job satisfaction and organizational justice on organizational citizenship behavior with organization commitment as the moderator. International Journal of Humanities and Social Science, 4(9).
- Athar, W. (2014). Factors influencing job satisfaction and its impact on job loyalty. International Journal of Learning & Development, 4(2), 1–21.
- Aziri, B. (2008). Human resource management, job satisfaction and motivation of employees. Gostivar, Macedonia: Tringa Design.
- Bass, B. M. (1985). Leadership and performance beyond expectations. New York: Free Press.
- Brockner, J. (1988). Self-esteem at work. Lexington, MA: D. C. Heath and Company.
- Bycio, P., Hackett, R. D., & Allen, J. S. (1995).
  Further assessments of Bass's conceptual-ization of transactional and transformational leadership. Journal of Applied Psychology, 80(4), 468–478.
- Silverthorne, C. (2001). A test of the path-goal leadership theory in Taiwan. Leadership & Organization Development Journal, 22(4), 151–158.
- Castillo, J. X., & Cano, J. (2004). Factors explaining job satisfaction among faculty.

- Journal of Agricultural Education, 45(3), 65–74.
- Chen, P. Y., & Spector, P. E. (1991). Negatively affectivity as the underlying cause of correlations between stressors and strains. Journal of Applied Psychology, 76, 398–407.
- Chiok Foong Loke, J. (2001). Leadership behaviours: effects on job satisfaction, productivity and organizational commitment. Journal of Nursing Management, 9(4), 191–204.
- Chioma, E., Japheth, A., & Oluseyi, A. (2016). A review of leadership theories, principles, styles and their relevance to management of health science libraries in Nigeria, 1(1), 17–26.
- Chughati, F. D., & Perveen, U. (2013). A study of teachers' workload and job satisfaction in public and private schools at secondary level in Lahore city Pakistan, 2(1), 202–214.
- Çinar, O., & Karcıoğlu, F. (2012). The level of job satisfaction in the public sector: A survey study in the province of Ağrı, Eastern Anatolia, Turkey. Economics and Management, 17(2), 712–718.
- Alderfer, C. P. (1969). Existence, relatedness, and growth; human needs in organizational setting. An empirical test of new theory of human need.
- Deci, E. L., & Ryan, R. M. (1985). Intrinsic mo-

- tivation and self-determination in human behaviour. New York: Plenum.
- Study on the Evaporation and Evapotranspiration Measured on the Căldăruşani Lake (Romania). *Procedia Environmental Sciences*, 32, 281–289.
- Tumbare, M. J. (2008). Managing Lake Kariba sustainably: threats and challenges.

  Management of environmental quality:

  An international journal.
- Valipour, M. (2015). Temperature analysis of reference evapotranspiration models. *Mete-orological Applications*, 22(3): 385–394.
- Van der Weert, R. and Kamerling, G. E. (1974). Evaporation of water hyacinth (Eichhornia crassipes). J. of hydrobiology, 22: 201-212.
- Villamagna, A. M., and Murphy, B. R. (010). Ecological and socio-economic impacts of invasive water hyacinth (*Eichhornia crassipes*): a review. *Freshwater biology*, 55(2): 282-298.
- Xu, C. Y. and Singh, V. P.(1998). Dependence of evaporation on meteorological variables at different time-scales and inter comparison of estimation methods. *Hydrological processes* 12(3): 429-442.
- Zhao, J., Xu, Z. X., Zuo, D. P., & Wang, X. M. (2015). Temporal variations of reference evapotranspiration and its sensitivity to meteorological