DATA ARTIKEL

Judul Artikel	: Practical-Empirical Modeling on Envelope Design towards Sustainability in Tropical Architecture
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Nomor ISSN	: 2071-1050
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REKAP BUKTI KORESPONDENSI

Tanggal	Keterangan
22 Februari 2021	Manuscript Submission Received
22 Februari 2021	Manuscript Asistant Editor Assigned
2 Maret 2021	Manuscript Accepted for Publication
5 Maret 2021	Final Proofreading Before Publication
9 Maret 2021	Article Available Online

[Sustainability] Manuscript ID: sustainability-1137218 - Submission Received

2 pesan

Editorial Office <sustainability@mdpi.com> 22 Februari 2021 pukul 01.21
Balas Ke: sustainability@mdpi.com
Kepada: Erni Setyowati <ernisetyowati@arsitektur.undip.ac.id>
Cc: Lili Kusumawati <lili.kusumawati@trisakti.ac.id>, Agus Budi Purnomo <agusbp@trisakti.ac.id>

Dear Dr. Setyowati,

Thank you very much for uploading the following manuscript to the MDPI submission system. One of our editors will be in touch with you soon.

Journal name: Sustainability
Manuscript ID: sustainability-1137218
Type of manuscript: Article
Title: Practical-Empirical Modeling on Envelope Design towards Sustainability in tropical Architecture
Authors: Lili Kusumawati, Erni Setyowati *, Agus Budi Purnomo
Received: 21 February 2021
E-mails: lili.kusumawati@trisakti.ac.id, ernisetyowati@arsitektur.undip.ac.id, agusbp@trisakti.ac.id

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Fax: +41 61 302 89 18

*** This is an automatically generated email ***

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erni setyowati <ernisetyowati@arsitektur.undip.ac.id> 22 Februari 2021 pukul 01.23
Kepada: Sustainability Editorial Office <sustainability@mdpi.com>
Cc: Lili Kusumawati <lili.kusumawati@trisakti.ac.id>, Agus Budi Purnomo <agusbp@trisakti.ac.id>

Thank you very much.
[Kutipan teks disembunyikan]

[Sustainability] Manuscript ID: sustainability-1137218 - Assistant Editor Assigned

2 pesan

Daniel Zhang <daniel.zhang@mdpi.com> 22 Februari 2021 pukul 09.33
Balas Ke: daniel.zhang@mdpi.com
Kepada: Erni Setyowati <ernisetyowati@arsitektur.undip.ac.id>
Cc: Daniel Zhang <daniel.zhang@mdpi.com>, Lili Kusumawati <lili.kusumawati@trisakti.ac.id>, Agus Budi Purnomo <agusbp@trisakti.ac.id>, Sustainability Editorial Office <sustainability@mdpi.com>

Dear Dr. Setyowati,

Your manuscript has been assigned to Daniel Zhang for further processing who will act as a point of contact for any questions related to your paper.

Journal: Sustainability
Manuscript ID: sustainability-1137218
Title: Practical-Empirical Modeling on Envelope Design towards Sustainability in tropical Architecture
Authors: Lili Kusumawati , Erni Setyowati *, Agus Budi Purnomo

Received: 21 February 2021
E-mails: lili.kusumawati@trisakti.ac.id, ernisetyowati@arsitektur.undip.ac.id, agusbp@trisakti.ac.id

You can find it here:
https://susy.mdpi.com/user/manuscripts/review_info/5a2e3daa5fb073eb673752bbe9f3d9af

Best regards,
Assistant Editor
E-Mail: daniel.zhang@mdpi.com
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erni setyowati <ernisetyowati@arsitektur.undip.ac.id> 24 Februari 2021 pukul 19.05
Kepada: Daniel Zhang <daniel.zhang@mdpi.com>

Dear Assistant Editor,

Thank you for informing us.

Best Regards,
Erni Setyowati
[Kutipan teks disembunyikan]

[Sustainability] Manuscript ID: sustainability-1137218 - Accepted for Publication

2 pesan

Sustainability Editorial Office <sustainability@mdpi.com> 2 Maret 2021 pukul 15.59
Balas Ke: Sustainability Editorial Office <sustainability@mdpi.com>
Kepada: Erni Setyowati <ernisetyowati@arsitektur.undip.ac.id>
Cc: Lili Kusumawati <lili.kusumawati@trisakti.ac.id>, Agus Budi Purnomo <agusbp@trisakti.ac.id>, Sustainability Editorial Office <sustainability@mdpi.com>

Dear Dr. Setyowati,

We are pleased to inform you that the following paper has been officially accepted for publication:

Manuscript ID: sustainability-1137218
Type of manuscript: Article
Title: Practical-Empirical Modeling on Envelope Design towards Sustainability in tropical Architecture
Authors: Lili Kusumawati, Erni Setyowati *, Agus Budi Purnomo
Received: 21 February 2021
E-mails: lili.kusumawati@trisakti.ac.id, ernisetyowati@arsitektur.undip.ac.id, agusbp@trisakti.ac.id

https://susy.mdpi.com/user/manuscripts/review_info/5a2e3daa5fb073eb673752bbe9f3d9af

We will now make the final preparations for publication, then return the manuscript to you for your approval.

If, however, extensive English edits are required to your manuscript, we will need to return the paper requesting improvements throughout.

We encourage you to set up your profile at SciProfiles.com, MDPI's researcher network platform. Articles you publish with MDPI will be linked to your SciProfiles page, where colleagues and peers will be able to see all of your publications, citations, as well as your other academic contributions.

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Kind regards,
Assistant Editor
E-Mail: daniel.zhang@mdpi.com
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erni setyowati <ernisetyowati@arsitektur.undip.ac.id> 2 Maret 2021 pukul 21.43
Kepada: Sustainability Editorial Office <sustainability@mdpi.com>
Cc: Lili Kusumawati <lili.kusumawati@trisakti.ac.id>, Agus Budi Purnomo <agusbp@trisakti.ac.id>, Sustainability Editorial Office <sustainability@mdpi.com>

Thank you for the great news!
[Kutipan teks disembunyikan]

[Sustainability] Manuscript ID: sustainability-1137218 - Final Proofreading Before Publication

4 pesan

Sustainability Editorial Office <sustainability@mdpi.com> 5 Maret 2021 pukul 20.51
Balas Ke: Daniel Zhang <daniel.zhang@mdpi.com>, Sustainability Editorial Office <sustainability@mdpi.com>
Kepada: Erni Setyowati <ernisetyowati@arsitektur.undip.ac.id>
Cc: Lili Kusumawati <lili.kusumawati@trisakti.ac.id>, Agus Budi Purnomo <agusbp@trisakti.ac.id>, Sustainability Editorial Office <sustainability@mdpi.com>, Daniel Zhang <daniel.zhang@mdpi.com>

Dear Dr. Setyowati,

We invite you to proofread your manuscript to ensure that this is the final version that can be published and confirm that you will require no further changes from hereon:

Manuscript ID: sustainability-1137218
Type of manuscript: Article
Title: Practical-Empirical Modeling on Envelope Design towards Sustainability in tropical Architecture
Authors: Lili Kusumawati, Erni Setyowati *, Agus Budi Purnomo
Received: 21 February 2021
E-mails: lili.kusumawati@trisakti.ac.id, ernisetyowati@arsitektur.undip.ac.id, agusbp@trisakti.ac.id

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Supplementary and other additional files can be found at the second link. We look forward to hearing from you soon.

Kind regards,

Samuel Li
Assistant Editor
E-mail: samuel.li@mdpi.com
--
Mr. Samuel Li
MDPI Branch Office, Beijing
Sustainability Editorial Office
E-mail: sustainability@mdpi.com
http://www.mdpi.com/journal/sustainability/

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erni setyowati <ernisetyowati@arsitektur.undip.ac.id> 6 Maret 2021 pukul 19.42
Kepada: Daniel Zhang <daniel.zhang@mdpi.com>, Sustainability Editorial Office <sustainability@mdpi.com>

Dear Samuel Li
(Assistant Editor)

Many thanks for your email. I am writing to inform you that we are now progressing the final proofreading of the manuscript as well as trying to improve some parts refer to the suggestions, so the paper would have been better. However, we need additional time to do that. We are trying to submit the paper due date Monday, 8th March 2021. Could we?

Best regards,
Erni Setyowati
[Kutipan teks disembunyikan]

Daniel Zhang <daniel.zhang@mdpi.com> 8 Maret 2021 pukul 07.39
Kepada: erni setyowati <ernisetyowati@arsitektur.undip.ac.id>

Dear Dr. Setyowati,

Thank you very much for your e-mail. Sorry for the late response due to out of office on 5th March. Sure, we would be very appreciated if you could finish the proofreading and resubmit the paper today. For any further questions, please feel free to let us know.

We are looking forward to hearing from you. Have a nice day.

Kind regards,
Daniel Zhang
Section Managing Editor

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Sustainability receives its 7th Impact Factor, 2.576 (2019)

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erni setyowati <ernisetyowati@arsitektur.undip.ac.id> 8 Maret 2021 pukul 10.57
Kepada: Daniel Zhang <daniel.zhang@mdpi.com>

Dear Daniel Zhang,

Many thanks for the information. Yes, we have finished the proofread today, right now we are doing final check, and we will submit it tonight

Best regards,
Erni Setyowati
[Kutipan teks disembunyikan]

Gmail erni setyowati <ernisetyowati@arsitektur.undip.ac.id>

[Sustainability] Manuscript ID: sustainability-1137218; doi: 10.3390/su13052959. Paper has been published.

4 pesan

sustainability@mdpi.com <sustainability@mdpi.com> 9 Maret 2021 pukul 16.37
Balas Ke: daniel.zhang@mdpi.com, sustainability@mdpi.com
Kepada: lili.kusumawati@trisakti.ac.id, ernisetyowati@arsitektur.undip.ac.id, agusbp@trisakti.ac.id
Cc: billing@mdpi.com, website@mdpi.com, sustainability@mdpi.com, daniel.zhang@mdpi.com

Dear Authors,

We are pleased to inform you that your article "Practical-Empirical Modeling on Envelope Design towards Sustainability in Tropical Architecture" has been published in Sustainability and is available online:

Abstract: https://www.mdpi.com/2071-1050/13/5/2959
PDF Version: https://www.mdpi.com/2071-1050/13/5/2959/pdf
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Thank you for choosing Sustainability to publish your work, we look forward to receiving further contributions from your research group in the future.

Kind regards,

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sustainability@mdpi.com <sustainability@mdpi.com> 9 Maret 2021 pukul 19.01
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Manuscript: https://www.mdpi.com/2071-1050/13/5/2959/manuscript (available to authors after login)

The issue release date for your article is 2021-03-12.
[Kutipan teks disembunyikan]

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erni setyowati <ernisetyowati@arsitektur.undip.ac.id> 9 Maret 2021 pukul 20.11
Kepada: Sustainability Editorial Office <sustainability@mdpi.com>

Dear Sustainability,

We would like to thank Sustainability for such a good opportunity on publishing our manuscript.

Best regards,
Erni Setyowati
[Kutipan teks disembunyikan]

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erni setyowati <ernisetyowati@arsitektur.undip.ac.id> 9 Maret 2021 pukul 22.18
Kepada: Daniel Zhang <daniel.zhang@mdpi.com>, Sustainability Editorial Office <sustainability@mdpi.com>

Dear Sustainability,

Thank you for publishing our manuscript.

Best regards,
Erni Setyowati
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Revision Process Before Resubmit Manuscript

Sustainability | Free Full-Text | Practical-Empirical Modeling on Envelope Design towards Sustainability in Tropical Architecture (mdpi.com)

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Peer-Review Record

Practical-Empirical Modeling on Envelope Design towards Sustainability in Tropical Architecture

Sustainability **2021**, *13*(5), 2959; https://doi.org/10.3390/su13052959

by Lili Kusumawati [1,2], Erni Setyowati [3,*] and Agus Budi Purnomo [1]

Reviewer 1: Anonymous

Reviewer 2: Anonymous

Sustainability **2021**, *13*(5), 2959; https://doi.org/10.3390/su13052959

Received: 21 February 2021 / Accepted: 2 March 2021 / Published: 9 March 2021

Round 1

Reviewer 1 Report

I would like to thank the authors for their efforts to improve their paper and to respond to the reviewer remarks.

Reviewer 2 Report

After numerous revisions, the main issues have been resolved.

This manuscript is a resubmission of an earlier submission. The following is a list of the peer review reports and author responses from that submission.

Round 1

Reviewer 1 Report

The article presents typical engineering tools for architects and designers which can be used with limitations.

I cannot understand why the authors don't prepare a response to the reviewer. I need more time to check all the corrections myself, especially because the authors change the numbers of the tables.

The sign X in formula (4) is misleading.

Line 428 – look at the word "façade".

Author Response

We wish to re-submit after revision the research article entitled **"Practical-Empirical Modeling on Envelope Design towards Sustainability in tropical Architecture"** for consideration by Sustainability before published.

We have corrected the manuscript refer to the reviewers suggestion and advices.

We do revise considering your comments with the track change version document that you suggest us to do. Herewith the improvement notes as follows:

1. **The article presents typical engineering tools for architects and designers which can be used with limitations**.

REPLY: (lines 119 – 126)

"Yes we agree with you. If the concept of OTTV should influence architecture, there should be a simple way or rule of thumb to estimate OTTV that can give an architect a quick estimate of OTTV in earliest phase of design so it does not hinder their creative process. We consider the calculation steps of OTTV based on SNI (Indonesia National Standard) and the GBCI (Green Building Council of Indonesia) is too complex for the inclusion of the concept of OTTV in the early design phase. Of course the equations reported in our paper are rule of thumbs. It cannot replace the complete calculation of OTTV. There are some limitations. First as it is described correction we made in the paper, the equation only considered the radiation part of OTTV, while the other two conductions part as constant. This because we considered the variables that are used to calculate the radiation portion are more of design variables that are being considered in the earliest phase of most architectural design. Second, the base of our rules of thumb is the OTTV as it is defined by SNI and become a Indonesian National Standard. If we look at the OTTV of the SNI, it does not consider the wide and large differences of places in Indonesia. For instance, the SF in SNI to be used nationally in actual is the results climate measurement in Jakarta. Recently there had been some other SF table developed by other cities. We have not studied the possible regional differences from city to city, and place to place in Indonesia. We intend to do such study after reporting the current research based on SNI and GBCI."

2. **I cannot understand why the authors don't prepare a response to the reviewer. I need more time to check all the corrections myself, especially because the authors change the numbers of the tables.**

REPLY:

"We apoligize for our team lack of experience in communicating with major international journal like Sustainability. We are sorry to have caused the reviewer troubles in reading our correction of the paper. In the future we will try not to cause such trouble any more. This is our team first research paper submittted to international journal. Please be kind enough to guide us to become a good and experienced research team. Thank you."

3. **The sign X in formula (4) is misleading.**

REPLY: the sign x has been replaced by ( ), see several lines (lines 80, 98, 101, 102)

4. **Line 428 – look at the word "façade":**

Refer to the Indonesian standard of SNI 6389:2011, the formula of Overall Thermal Transfer Value in a building's ***envelope*** consists of heat conduction through massive walls, heat conduction through the transparent wall and solar heat gain.

REPLY: "façade" replaced by envelope. (line 510)

In OTTV calculations, it is more accurate to use the word envelope in this study, the subject of the simulation is part of the envelope, which is part of the facade called "architrave" or span, in Indonesia, it is often referred to as "trafe".

Those are our answers to your questions and comments. Hopefully the answers have fulfilled your expectations.

Best regards,

Corresponding author

Author Response File: **Author Response.docx**

Reviewer 2 Report

The paper intitled "Practical-Empirical Modeling on Envelope Design 2 towards Sustainability in Tropical Architecture" aims to simplify the equation of the overall thermal transfer value (OTTV) in order to make it easy for architectes. The objective seems clear, but we still need to know on what the authors based their assertion that the current manner to calculate OTTV is difficult for architects using.
Then, to reach this objective, the methodology seems confusing. Reading the paper is not easy. Moreover the highlighted (with diffrent colours) parts do not help.

- Why the authors did not used the ETTV as it is the reviwed version of OTTV and seems to giv ebest results?
- In page 4 line 135-136, t" Based on empirical experience, there are many studies on multi-story office buildings, even 135 though campus buildings are still lacking, especially those located in Jakarta". Could the authors cited these studies?
- Do you think that the use of concrete shading could be problematic as they can cause overheating at night when heat is released?
- Remove table 1.
- How did the authors obtained the equation 8? In equation 2 SC*WWr*SF represents only the solar heat gains, why they neglected the conductive part representing 42% in equation 8?
- In the OTTV intiale equation, the solar heat gains represent 87% whereas in your calculation it represents 58%. With this big difference in the radiative gains, you obtain a RMSE of 1.74 and an error of 0%, how do you explain this?

Although the subject is very interesting, I cannot accept the paper as is. I propose to the authors to better structure it, to summarize some descriptive parts, to have a more solid scientific methodology by explaining at each step the objective, the simulation tools used, then the results, etc. The validation section deserves to be more detailed and discussed.

Author Response

28th December 2020

Dear REVIEWER# 2,

We wish to re-submit after revision the research article entitled **"Practical-Empirical Modeling on Envelope Design towards Sustainability in tropical Architecture"** for consideration by Sustainability before published.

We have corrected the manuscript refers to the reviewer's suggestion and advice.

We do revise considering your comments with the track change version document. Herewith the improvement notes as follows:

Response to REVIEWER #2

1. **Why the authors did not use the ETTV as it is the revised version of OTTV and seems to give the best results?**

REPLY: (lines 118-122)

ETTV has indeed been used abroad, but Indonesia had just recently used OTTV as a national standard that regulates architectural design. The calculation of OTTV according to SNI 6389: 2011 is too complicated for architects, especially to do the initial design so that the implementation of OTTV still needs to be developed in Indonesia.

2. **In page 4 line 135-136, Based on empirical experience, there are many studies on multi-story office buildings, even though campus buildings are still lacking, especially those located in Jakarta". Could the authors cite these studies?**

REPLY: **(lines 175-176)**

Since OTTV became a part of the national standard in Indonesia beginning in 2011, there are many studies on multi-story office buildings in Indonesia. However, the application of OTTV in other types of building, such as campus buildings are still lacking (lines 175-176)

Here are some new citations to support the above statements:

35. Mayona E. L. and Fernanda, B. The Potential of Green Campus Concept Application to Green Open Space Attributes at the National Institute of Technology (Itenas) Bandung. *J. Rekayasa Hijau*, 2019, 3 (2).
36. Busaeri, N. Analysis of the University's Readiness Level Towards a Green Campus from the Energy Aspect Based on Three Measurement Standards. *J. ENERGY Electr. Eng.*, 2020.
37. Purwanto E. and Setioko, B. Study of Green Open Space Arrangement of Green Campus Concept at Diponegoro University Campus, Tembalang. *Modul*, 2018, 18 (1), 9.

3. **Do you think that the use of concrete shading could be problematic as they can cause overheating at night when the heat is released?**

REPLY: (lines 183-187)

In Indonesia, although building structures are generally made to reinforced concrete, shading devices are not always made of concrete. In general, the use of concrete can cause a lot of thermal release at night. However, because the variations of weather in most part of Indonesia is not very significant. The temperature difference between day and night is almost the same. Therefore, thermal dissipation at night is relatively small.(lines 183-187)

4. **Remove table 1.**

REPLY: (see line 313-317)

Table 1 has been removed and replaced by "new Table 1" (lines 298-302)

Tabel 1. Solar Radiation Orientation Factor (W/ m^2) with angle [17]

Orientation	SF	Orientation angle (OA°)
East	112	0° (360^O)
Northeast	113	45^O
North	130	90^O
Northwest	211	135^O
West	243	180^O
Southwest	176	225^O
South	97	270^O
Southeast	97	315^O

Table 1 is a development of the data on SNI 6389: 2011 which explains the solar factor (SF) in various orientations, then SF is connected with the design variable in the form of the facade orientation angle (OA)

5. **How did the authors obtain equation 8? In equation 2 SC*WWR*SF represents only the solar heat gains, why they neglected the conductive part representing 42% in equation 8?**

REPLY: (lines 330-339, 403-410)

….Eq. (2) (line 98)

…Eq. (8) (line 330)

1. Like had been explained above, the simple formula introduced in this paper is actually a rule of thumb that can be used for a quick estimate of OTTV that is needed in the early phase of the design process (conceptual and preliminary design phase).
2. It is assumed that the two conduction portions of OTTV as constant, and instead we emphasize the radiation portion.
3. It seems that the simple equation to estimate OTTV proposed in this paper deal only with the radiation portion to get the whole part of OTTV. However, the equation does not negate the role of conduction portions of the OTTV.
4. In the simple formula or rule of thumb proposed in this paper, the conduction parts of OTTV is considered as constant, where in all simulation cases, it is assumed that the SC of glass is equal to 0.95, and all wall is made of bricks.
5. There is a problem with what can be considered as the percent of OTTV that institutes its radiation portion?
6. There are several choices that can be used as radiation percentages to calculate the whole OTTV.
7. First, it can be considered that radiation is 87% of OTTV as mentioned by Mc Cluney [26]. Mc Cluney got the 87% from a setting without any shading device, and only wall and fenestration.
8. Second, with a similar condition as Mc Cluney, the data reported in this paper show that the average radiation portion of OTTV is 68%.
9. Third, the simple equation could use the radiation portion of OTTV from the result of the 300 facades/architrave simulation, where the dimension of shading device exists, and most of R_1 and R_2 are not equal to 0 such as in Mc Cluney. From the 300 simulations, it is known that the average portion of the radiation is 58% of the OTTV. In this study, 300 trafe used single clear glass product ex indoflot 5mm # 1, with Uf = 5.9, SCglass = 0.95
10. If Mc Cluney's number (87%) is used, the estimate of OTTV will be smaller compared to if other radiation percentages of the OTTV were used.
11. However, if the number resulted from the simulation (58%) is used, the estimate of OTTV will be relatively larger.
12. Indonesia is a tropical country, it is local wisdom that most buildings in the country have certain types of shading devices. The furthermore larger estimate of OTTV will readily warn the architect more on the need to correct their facade/architrave design early in the design process. Therefore, in this study, 58% were used in the proposed simple equation or rule of thumb as the portion of radiation of the OTTV.

6. **In the OTTV initially equation, the solar heat gains represent 87% whereas in your calculation it represents 58%. With this big difference in the radiative gains, you obtain an RMSE of 1.74 and an error of 0%, how do you explain this?**

REPLY: (lines 327-337, 403- 410)

OTTV = OTTV portion of SHG / 0.58 means, from simulation data with 300 trafe, the average portion of the solar radiation gain from OTTV is 58%, which means the largest value compared to the two conduction portions. So 0.58 OTTV = SHG, which means OTTV = SHG / 0.58. The second conduction talks about building materials at the beginning of architectural design when simple formulas were not really needed. Furthermore, after the architectural form is determined based on the simple OTTV formula, a more complete calculation of OTTV can be carried out by a building physicist. So as with the initial design of the structure, architects generally calculate the dimensions of the beam based on the rule of thumb, and after the initial design, a more complete structural calculation can be carried out by a civilian expert.

Explanation about 87% that change to 58% are:

1. Like had been explained above, the simple formula introduced in this paper is actually a rule of thumb that can be used for a quick estimate of OTTV that is needed in the early phase of the design process (especially the conceptual and preliminary design phase).
2. It is assumed that the two conduction portions of OTTV as constant, and instead we emphasize the radiation portion.
3. It seems that the simple equation to estimate OTTV proposed in this paper deal only with the radiation portion to get the whole part of OTTV. However, the equation does not negate the role of conduction portions of the whole OTTV.
4. In the simple formula or rule of thumb proposed in this paper, the conduction parts of OTTV is considered as constant, wherein all simulation cases the SC of glass is equal to 0.95, and all wall is made of bricks.
5. There is a problem with what can be considered as the percent of OTTV that constitutes its radiation portion?
6. There are several choices that can be used as radiation percentages to calculate the whole OTTV.
7. First, as states by Mc Cluney the radiation 87% of OTTV [26] . Mc Cluney got the 87% from a setting without any shading device, and only wall and fenestration.

8. Second, with similar conditions as Mc Cluney, the data reported in this paper show that the average radiation portion of OTTV is 58%.
9. Third, the simple equation could use the radiation portion of OTTV from the result of the 300 facades/architrave simulation, where the dimension of shading device exists, and unlike Mc Cluney, most of R1 and R2 is not equal to 0. From the 300 simulations, it is known that the average portion of the radiation is 58% of the OTTV. In this study 300 trafe used single clear glass product ex indoflot 5mm # 1, with U value of fenestration = 5.9, and the SCglass = 0.95
10. If Mc Cluney's number (87%) is used, the estimate of OTTV will be smaller compared to other radiation percentages of the OTTV which were used.
11. However, if the number resulted from the simulation (58%) is used, the estimate of OTTV will be relatively larger.
12. Since a larger estimate of OTTV will readily warn the architect more on the need to correct their facade/architrave design, 58% were used in the proposed simple equation or rule of thumb as the portion of radiation of the OTTV.

Our explanation about the error and RSME is (line 473 – 486):

1. Two types of parameters were used to validate the simple equation or rules of thumb of the OTTV proposed in this paper. The first parameter is APE or the Average Percentage Error.

$APE= (sum((OTTV_1-OTTV_2)/OTTV_1)*100\%)/n,$

The second parameter is the RSMSE=rootsquare mean square error.

$RSMSE= root\ square((\ sum((OTTV_1-OTTV_2\ )\hat{}2))/n),$

where $OTTV_1$=OTTV calculated by using the method in SNI, $OTTV_2$=OTTV calculated by using the simplified equations or rules of thumb proposed in this paper, and 'n' is the number of architraves in the simulation, n=300.

2. Two types of validation were done to the OTTV by calculating APE and RSMSE within the 300 cases of facade/architrave (internal validation) and on the 30 extra cases that are not in the 300 cases that were used to calculate the equations but left out for cross-validation.
3. We apologize since both of the parameters (APE =0% and RSMSE=1.74) written on the paper is our mistake
4. From the internal validation, the correct APE =10.24%, and RSMSE=4.06 W/m^2.
5. From the cross-validation, the correct APE=9.21%, and RSMSE=3.68 W/m^2.

Those are our answers to your questions and comments. Hopefully, the answers have fulfilled your expectations.

Best regards,

Corresponding author

Author Response File: **Author Response.docx**

Reviewer 3 Report

Studying the topic of sustainable buildings in hot and humid climates is certainly an interesting topic.

Precisely for this reason it should be faced by analyzing the methods, tools and legislation developed in the international context (cfr. EU, UK, ecc) in order to subsequently be able to apply it competently, recalibrating it if necessary, to the local context.

Without this preliminary study, the work runs the risk of following already existing paths without, therefore, new contributions or worse, excluding, without solid reasons, decisive aspects.

Statements such as the following are highly questionable:

1. …In the OTTV formula, the second variable is a variable that is easy for architects to understand…
2. …Accordingly, the effort to develop effective solutions for the sustainable improvement covering green and low carbon environment as well as building energy performance have been made in recent years [1, 2]….
3. …Saving energy efforts in the building should be started from the facade building design of which it has to protect radiation as much as possible for HVACs' electricity consumption. ..
4. …On that term, this current research not only emphasizes the main variables used consisting of the window to wall ratio 20 (WWR), shading coefficient for the fenestration system (SC), and solar radiation factor (SF). ..

Finally, the final result is not very convincing: the "simplified" formula for the calculation of OTTV.

Author Response

28th December, 2020

Dear REVIEWER #3,

We wish to re-submit after revision the research article entitled **"Practical-Empirical Modeling on Envelope Design towards Sustainability in tropical Architecture"** for consideration by Sustainability before published.

We have corrected the manuscript refer to the reviewers suggestion and advices.

We do revise considering the your comments with the track change version document. Herewith the improvement notes as follows:

Response to REVIEWER #3

There are several questionable statements:

1. **...In the OTTV formula, the second variable is a variable that is easy for architects to understand...**

REPLY: (lines 150-170)

In the OTTV formula, the second variable is a variable that is easy for architects to understand, while the first and third variables are variables that are relatively strange and hard for most architects [3]. The concept of OTTV should be used in all steps of architectural design. If it is possible OTTV should be used as a consideration in the conceptual phase and preliminary design phase where building orientation and forms are more being emphasized compare to other aspects of architecture. According to SNI (Indonesia National Standardization Office), OTTV consists of three-part. The first part is the thermal conduction through a wall. The second part is the thermal conduction through a fenestration or glass. The third part is the thermal radiation. In all of the parts of OTTV, there is the variable WWR (Window to Wall Ratio). WWR can be considered as a variable of building form. In the third part, along with the WWR, there are the Shading Coefficient (SC) of the shading device and Solar Factor (SF). SC is determined by horizontal (R_1) and vertical (R_2) projection or fin. The dimension of the horizontal and vertical fin can be considered as two more variables of building form. According to SNI, SF is determined by the surface orientation of the building envelope and the location of the building site. Surface orientation is another architectural variable that must be determined early in the design process. Therefore, SF can also be considered as an important design variable that must be decided early as in the conceptual and preliminary design phases. Out of the three parts of OTTV, therefore, the thermal radiation part contains the largest number of design variables that must be decided in the earliest design phase. In the early phase of the design process, as not to hinder the creative process of the architect, a relatively simple and easy to use rule of thumb that can be used to estimate OTTV is needed. Therefore, it is assumed that for a quick estimate of OTTV, the rules of thumb should be related as much as possible to the variables of building forms and orientation.

2. **...Accordingly, the effort to develop effective solutions for the sustainable improvement covering green and low carbon environment as well as building energy performance have been made in recent years [1, 2]....**

REPLY: (lines 38-50)

Accordingly, the effort to develop effective solutions for the sustainable improvement covering green and low carbon environment as well as building energy performance have been made in recent years [1, 2]. For example, just as recent as 2009, Indonesia formally acknowledges the need for green design by establishing the Green Building Council of Indonesia (GBCI). One of the most important programs of GBCI is to give certificates and rank to building in terms of their energy-saving performance. Like other tropical countries, one of the important indicators used by GBCI in ranking energy-saving performance is the use of energy di cooling. GBCI considered by decreasing OTTV, the energy used for cooling can also be lowered. To optimize the energy for cooling, the design of the building envelope should be directed to optimize its ability to control thermal energy from the sun that goes into the interior of a building (Zakariyaarif, "Green Building Ranking Based on Green Building Council Indonesia Standards for Existing Building Category," *zakariyaarif.web.ugm.ac.id*, 2015.) [3]

3. **...Saving energy efforts in the building should be started from the facade building design of which it has to protect radiation as much as possible for HVACs' electricity consumption**

REPLY: (lines 45-50)

In the urban condition of a tropical country such as Indonesia, where most buildings can not have enough space for cross ventilation and other efforts to cool the interior of buildings, air conditioning is used (Prasetyo et. Al., 2019; Katili et. Al., 2015). It is known that 30% to 56% of the energy used in the building of a tropical country is for cooling. To optimize the energy for cooling, the design of the building envelope should be directed to optimize its ability to control thermal energy from the sun that goes into the interior of the building. (W. W. P. Heru Prasetio, Kezia Dara Euodia, "Techno-economic analysis of a combined cooling, heating and power system based on hot sedimentary aquifer for hotel building in tropical countries.," *MATEC Web Conf. 268*, 2019.

1. Wi. Adrian R Katili, Rabah Boukhanouf, "Space Cooling in Buildings in Hot and Humid Climates – a Review of the Effect of Humidity on the Applicability of Existing Cooling Techniques," *14th Int. Conf. Sustain. Energy Technol. – SET 2015*, 2015). [4, 5]. Saving energy efforts in the building should be started from the facade building design of which it has to protect radiation as much as possible for HVACs' electricity consumption.

4. **....On that term, this current research not only emphasizes the main variables used consisting of the window to wall ratio (WWR), shading coefficient for the fenestration system (SC), and solar radiation factor (SF).**

REPLY: (lines 18-22)

In that term, this current research emphasized the main variables used are the window to wall ratio (WWR), the shading coefficient for the fenestration system (SC), and the solar radiation factor (SF. The words "not only" should be striken out. The sentence "but also highlight practical modeling to make it easier for architect .." should also be striken out.

Our explanation below might be able to make clear this statement:

1. Like had been explained above, the simple formula introduced in this paper is actually a rule of thumb that can be used for a quick estimate of OTTV that is needed in the early phase of the design process (especially the conceptual and preliminary design phase).
2. It is assumed that the two conduction portions of OTTV as constant, and instead we emphasize the radiation portion.
3. It seems that the simple equation to estimate OTTV proposed in this paper deal only with the radiation portion to get the whole part of OTTV. However, the equation does not negate the role of conduction portions to the whole OTTV.
4. In the simple formula or rule of thumb proposed in this paper, the conduction parts of OTTV is considered as constant, wherein all simulation cases the SC of glass is equal to 0.95, and all wall is made of bricks.
5. There is a problem with what can be considered as the percent of OTTV that constitutes its radiation portion?
6. There are several choices that can be used as radiation percentages to calculate the whole OTTV.
7. First, it can be considered that radiation is 85% of OTTV as mentioned by Mc Cluney [26]. Mc Cluney got the 85% from a setting without any shading device, and only wall and fenestration.
8. Second, with similar conditions as Mc Cluney, the data reported in this paper show that the average radiation portion of OTTV is 68%.
9. Third, the simple equation or rule of thumb could use the radiation portion of OTTV from the result of the 300 facades/architrave simulation, where the dimension of shading device exists, and most of R_1 and R_2 is not equal to 0 such as in Mc Cluney. From the 300 simulations, it is known that the average portion of the radiation is 58% of the OTTV. In this study, 300 architrave used 5mm # 1 indoflot clear glass, Uf = 5.9, SC_{glass} = 0.95
10. If Mc Cluney's number (87%) is used, the estimate of OTTV will be smaller compared to other conditions where other radiation percentages of the OTTV were used.
11. However, if the number resulted from the simulation (58%) is used, the estimate of OTTV will be relatively larger.
12. Since a larger estimate of OTTV will readily warn the architect more on the need to correct their facade/architrave design, 58% were used in the proposed simple equation or rule of thumb as the portion of radiation of the OTTV

Those are the answers as responses to the Reviewers questions. Hopefully, the answers could fulfill all the reviewer's expectations.

Best regards,

Corresponding author

Author Response File: **Author Response.docx**

Round 2

Reviewer 2 Report

I would like to thanks the authors for their responses. Despite this, the scientific work still needs to be improved.
The authors claim that the calculation of OTTV according to SNI 6389: 2011 is too complicated for architects. I am not agree, with this comment as they should do this calculation even it is complicated, to show the differences between the last and the current regulations in Indonisia.
In addition, additional validations are required to confirm the results of the simplified used method.

Author Response

Dear Reviewer#2,

Enclose herewith your review for our manuscript continuing with our responses as follows:

Open Review

(x) I would not like to sign my review report
( ) I would like to sign my review report

English language and style

( ) Extensive editing of English language and style required
( ) Moderate English changes required
( ) English language and style are fine/minor spell check required
(x) I don't feel qualified to judge about the English language and style

I would like to thanks the authors for their responses. Despite this, the scientific work still needs to be improved.
The authors claim that the calculation of OTTV according to SNI 6389: 2011 is too complicated for architects. I am not agree, with this comment as they should do this calculation even it is complicated, to show the differences between the last and the current regulations in Indonesia.
In addition, additional validations are required to confirm the results of the simplified used method.

Reviewer #2

And, these are our responses to your questions:

RESPONSES TO THE REVIEWER#2

Our paper aims not to minimize but to help the effort of SNI in introducing the concept of OTTV to architects in Indonesia. However, as a convention, Indonesian architects were mostly educated as artists, so they have lesser bends on quantitative and numerical thought. Our intention with our paper is to help SNI make OTTV a tool for architects to use at the start of the design process.

Lines: (296-312); (313-348); (349-364).

We think the method of OTTV calculation in SNI is complete. However, for an architect that is not numerically proficient, the SNI methods are rather cumbersome. There are 21+5 tables and four interpolations needed to be observed and done by an architect to calculate OTTV. Therefore, we are concern that most architects in Indonesia resist incorporating OTTV in their design and might not appreciate the good intention of SNI.

Lines: (114-119); (152-156)

Our practical formulas are not a replacement for the equations concerning OTTV in SNI. We are only trying to alleviate some of the cumbersome steps in SNI. In our paper, we introduce three equations. Equation 11 can help an architect to obtain SF (instead of one table and one interpolation). Equation 10 can calculate SC shading device (instead of the 21 tables and several interpolations in SNI). For instance, the calculation on SC of shading devices in SNI is the most cumbersome. To calculate SC shading device, we have to choose one or two tables from 20 tables. One table might be enough if the orientation angle (OA) is directed to the four cardinal directions or 45-degree angular increment to the cardinal directions. If our OA is between the values on the tables, we have to make a tabular interpolation, which is more complicated than simple interpolation between two scalar values. After deciding which table is used, if the R1 or R2 is between R's values in the chosen table, we have to do a scalar interpolation. We might also have to interpolate the angle of fins or overhangs and add to SNI method's cumbersomeness in calculating SC. All of the dependent variables (360 hundred cases of architraves) in our study (SF, SCeff, and OTTV) were computed using the SNI method. We experienced firsthand how cumbersome is the OTTV calculation method of SNI.

Lines: (114-119); (129-139)

Equation 9 can be used to combine WWR, SF, and SC of shading devices into OTTV. As it can be read in our paper, there are some assumptions in obtaining the three formulas. However, in the validation step in our paper, we can see that the result of calculating OTTV with the formulae is still within the design margin.

Lines: (140-151); (296-312)

We agree a more accurate calculation of OTTV might be needed (such in a more advanced phase of the design process or in education conditions where students have to be taught the complete concept about OTTV). In that case, we can exchange one of the empirical formula (Equation 9) with the full initial OTTV formula of SNI (Equation 1). Equation 1 in SNI is actually can be considered as a simple formula. It becomes cumbersome when SC of shading device and SF is being calculated using SNI methods. To make Equation 1 simpler, instead of calculating SC of shading device and SF using the original SNI method, SC and SF's calculation should use the formula introduced in our paper (Equation 10 and Equation 11).

Lines: (152-156); (296-312); (313-348); (349-364); (419-426); (427-439)

Validation was carried out on 30 cases that were not included in the 300 architraves which were used to obtain equations of 9.10 and 11. Cross-validation showed RMSE values of 3.86 W / m2 and APE of 9.31%. This value is still below the maximum thermal design margin of 25% at the initial design stage in the design development stage, and the plus-minus margin of 15%. If OTTV2 is calculated for 30 cross-validation cases using Equation 1, 10, and 11, RSME is 1.98 W / m2, and APE is 4.26% greater if OTTV is calculated by Equation 9, Equation 10, and Equation 11.

Lines: (366-397)

Hopefully, that our response have fulfilled your queries to our manuscript.

Kindly Regards,

Authors

Author Response File: **Author Response.docx**

Reviewer 3 Report

The goal of simplifying the application of an obligatory standard such as SNI 6389: 2011 can be shared but in this case the motivation is very weak. According to SNI 6389: 2011, the OTTV formula is

OTTV=α[Uw(1 WWR)TDeq]+[Uf(WWR)(ΔT)]+[(SC)(WWR)(SF)].

In the OTTV formula …"*it can be seen that there are three types of variables. The first is material variables such as the properties of the materials that make up the conduction part of OTTV. The second is the facade shape variables, such as WWR and SC, are effective. The third is the building orientation variable: SF. In the OTTV formula, the second variable is a variable that is easy for architects to understand, while the first and third variables are variables that are relatively strange and hard for most architects".*

In the Faculties of Architecture, students learn how to calculate the thermal transmittance of the building envelope and to evaluate the influence of orientation.

In this context, the choice of materials must be set from the very early stages of design and the analogy with the simplified dimensioning of the beams is not adequate because, also in this case, it is necessary to define the material of the beam.

Furthermore, the simplification goes against the holistic spirit of the standard that deals not only with reducing energy consumption but also with environmental sustainability with a 360-degree vision.

Author Response

Dear Reviewer#3

Enclose herewith your queries to our manuscript and our responses to them as follows:

Open Review

(x) I would not like to sign my review report
( ) I would like to sign my review report

English language and style

( ) Extensive editing of English language and style required
( ) Moderate English changes required
( ) English language and style are fine/minor spell check required
(x) I don't feel qualified to judge about the English language and style

Continuing your queries, then we decide to respond to your queries as follows (attached by the manuscripts with highlight comments to clearer or responses):

RESPONSES TO REVIEWER# 3

The purpose of our paper is not to negate the complete aspect of OTTV. Our paper is to develop a simplified version of OTTV calculation. In the paper, we introduce three practical equations with assumptions:

1. The calculation of OTTV in SNI is too cumbersome (it involves at least looking at 21 tables, four interpolations, which at maximum can include 26 tables) for architects, especially in the earlier phase of a design process where a rapid introduction of ideas happens. We hope that an architect could benefit from OTTV on their design in the initial design stage with the practical equations. Continuing on the discussion about the material as variables on the design, we have added some related materials as variables to enrich the validation of empirical practical modeling as a rule of thumb in the early design process. And the validation has verified that the practical equation could be considered as the prediction of OTTV value in the preliminary design stage (see the validation subheading).

Lines: (114-119); (296-312); (369-399); (405-415); (427-439); (440-453); (462-468); (485-497).as attached in our manuscript

1. In some instances in the design development phase or in educational activities where students are asked to learn and applied OTTV in their design project, we could get back to the original SNI OTTV equation (back to Equation 1 instead of Equation 9 in our paper). But we must keep in mind that to make Equation 1 simple, we should keep Equation 10 and 11.

Lines: (419-426); (470-480); (485-497), as attached in our manuscript.

Hopefully, our responses have fulfilled your queries,

Kindly regards,

Authors

Author Response File: **Author Response.docx**

Round 3

Reviewer 2 Report

I would like to thank again the authors for these responses which clarify better the objective of the paper.

The authors proposed simplifies equations that can be used by architects which are not familiar with building physics.
The introduction, the conclusion and especially the abstract must underlind more that the practical formulas proposed are not a replacement of the equations concerning OTTV in SNI but bring help for architects in the preleminary stages of design process.

Reviewer 3 Report

Changes: Delete the text highlighted in red and replace it with the text in blue (see attached file)