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Forest burns and wildfires in Palmas County – Tocantins State: environmental education as instrument for Civil Protection and Defense (CPD) and school community

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ABSTRACT
The aim of the present study is to assess the interface between Civil Protection and Defense (CPD) and school environmental education to prevent forest burns and wildfires in Palmas County, Tocantins State. The investigation was based on bibliographic, documental and qualitative research carried out through interviews. Data about fire outbreaks provided by BDQUEIMADAS, of National Institute of Spatial Research (INPE), in the herein assessed county, between 2019 and 2021 were selected; schools were selected for interviews to be carried out with their direction board members. Civil Protection and Defense managers were also interviewed. The analyzed documents are related to action plans focused on fighting forest wildfire; they were provided by municipal and state Civil Protection and Defense bureaus. Tocantins Discipline Matrix, also known as DCT, and other instruments connected to it, due to initiatives aimed at Environmental Education in schools in Palmas County, Tocantins State, were analyzed. Based on the results, forest burns and wildfire events are a problem that has negative impact on Palmas' population and, consequently, on its school community. However, there are actions that have been developed in schools to help reducing the risks of these events and minimizing their impact.

Keywords: Burns; Risk; Civil Defense; Environmental Education.

1. INTRODUCTION

Forest burns and wildfire events have been following mankind since the most remote times. Fire, which is the very product among an oxidant (oxygen), heat (ignition source) and fuel (vegetation), is widely used in agriculture activities to clear and prepare the soil for crop grouping and livestock purposes. Fire is also widely used in urban zones as instrument to clean vacant or empty urban lots. Forest wildfire events have huge negative consequences and impact, besides their harming effects on the population exposed to the emissions of gases generated by biomass burning into the atmosphere. In addition, they rise temperature, decrease humidity and have implications in Cerrado region's fauna and flora, due to significant unbalance in its biome (MACHADO et al., 2014).

Forest wildfire events in Tocantins State are common. This state is inserted in the Cerrado Biome, and it joins a region where fire is constantly used in agricultural and livestock activities, which makes this state very vulnerable to huge forest wildfire events. Palmas County territory, the state's capital, is a little bigger than 2,200 Km² (IBGE), and most of this area is covered by vegetation; that is the reason why it is quite vulnerable to fire events and its population is exposed to the huge negative effects of them.

It is important that legal, institutional (National Policy of Civil Protection and Defense) and educational (National Law of Guidelines and Bases for Basic Education Common Discipline Matrix) instruments are used to develop and provide actions to reduce risks or to minimize the effects of forest wildfire events on Palmas County, Tocantins State. The interface between Civil Protection and Defense institutions and school community must connect Environmental Risk Management and Education aspects, according to the law. It is so, because they are public policies that complete each other and strategically set school community leading role, values, skills and competences through measures adopted in school environment to open room for positive impacts on economic, social and environmental aspects in it.

The aims of the present study were to detect interfaces between civil protection and defense, and school community through environmental education, from the forest burns and wildfires' aspect, as well as to analyze their frequency in Palmas County, between 2019 and 2021, to shine light over their negative impact on its population. The idea was to assess Civil Protection and Defense (CPD) and Environmental Education (EE) actions developed by institutions to minimize this issue and to assess connections between CPD and EE to reach

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positive outcomes based on both institutional engagement and school community's leading role.

2. LITERATURE REVIEW

2.1 Forest Burns and Wildfire events in Palmas – Tocantins State

Palmas is located in the central region of Tocantins State. Based on IBGE's estimates for 2021, its population is a little bigger than 313 thousand inhabitants and it accounts for almost 20% of the state's population, which was also estimated to be 1,607,000 inhabitants in 2021; yet, it is the state's most populous city. Its territory covers an area of 2,227km^2 and it represents less than 1% of Tocantins' total territory, based on IBGE (2022).

The Cerrado Biome is seen as the last agricultural frontier, where changes in soil coverage are happening fast (SANTOS et al., 2018). Palmas is inserted in this biome and suffers with forest burns and wildfire events as chronic and seasonal issue. Every year, the city is negatively affected by these events during the dry season, from May to October.

Palmas has a vast vegetation-cover area, and it makes this city prone to witness these hazardous climatological events, either in rural or urban zones. According to Borges Sobrinho (2021), Palmas was the 35th county in Tocantins State mostly presenting forest burns and wildfire events between 2009 and 2018.

Palmas region's climatological and geo-morphological features contributed to fire using as fast procedure to prepare and clear the soil, besides being a low-cost alternative (OLIVEIRA, 2018). Besides these features, one also observes Cerrado's phytophysiognomy, which makes the available ecosystem favorable for fire hatching and for its propagation (SANTOS et al, 2018).

This issue is not just observed in Palmas' rural zone, fire using in its urban zone has grown large (GOMES; SANTOS, 2010). The main reasons for adopting this procedure lie on burning domestic solid waste and on cleaning vacant or empty urban lots. These practices lead to increased emission of substances that can harm human health, because they increase the level of these substances to limits higher than the acceptable standards set for environments accounting for high population density.

The combination of climatic, geo-morphological and phytophysiognomic aspects to soil use and occupation, to sociodemographic aspects and to other anthropic actions play leading role in a scenario sensitive to forest burns and wildfire events in Palmas County. Procedures focused on Civil Protection and Defense, along with Environmental Education actions, can help reducing the risks of having these events and minimizing their impacts.

2.2 Environmental education as instrument for environmental protection and risks

Environmental education can be an important instrument for reasoning and for initiatives by societies suffering with socio-environmental risks and hazardous events. Environmental education is the process to build awareness about the causes, nature, magnitude and effects of socio-environmental risks.

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According to Matsuo and Silva (2021), environmental education must contribute to a series of competences and skills, such as solidarity and empathy, making choices based on complex situations, adjusting to changes in the environment and participating in decision-making processes. It must be done to make society join process to prevent hazardous socio-environmental events. Environmental education cannot be understood as a particular education type, but as something that limits values and practices that gather several social actors.

The need of setting new ways to build knowledge to promote alternative, flexible, dynamic and emancipatory education processes capable of promoting dialogue must be a pathway to forest wildfire management in Tocantins State, given nowadays socio-environmental risks.

Topics like wildfire events and pollution make individuals think when they are associated with Environmental Education. They also develop counterpoints and enquires that can contribute to change local political and economic management structures and, consequently, to help improving public policies.

The National Policy for Civil Protection and Defense, law n. 12.608, from 2012, states that "elementary and high school discipline matrices must integrate civil protection and defense, as well as environmental education principles, to mandatory contents" (BRASIL, 2012. p.10). There are only few references about risks of hazardous events in discipline matrices developed for Sciences and Geography disciplines (MATSUO and SILVA, 2021). The aforementioned paragraph was changed by law 13.415, from 2017, which made this duty more flexible for high school disciplines (BRASIL, 2017).

Such a need, in association with lack of structure in governmental bureaus in charge of risks management, leads to high indices of non-response to several hazardous environmental events. Based on Matsuo and Silva (2021), schools are formal spaces for Environmental Education, they are the right place to promote risk and disaster's reduction. There is no difference between formal and non-formal environmental education.

The Environmental Education approach in several education standards - mainly those provided in the National Law of Education Guidelines and Bases (1996), in many National Discipline Matrices Guidelines by the National Education Council and, most recently, in the National Common Discipline Matrix Basis (2018) - is a historical progression. It is possible observing that these standards still do not include Environmental Education at all teaching levels: basic and higher education; and in all modalities: education for youngsters and adults, professional and technological education, special education and distance learning.

It happens because regulating legislations do not explain how the environmental topic must be actually approached in school environment. BNCC, itself, defines that

> Reaching systems and networks, as well as schools, within their respective autonomy and competence scope, must embody the approach of contemporary topics to their discipline matrices and pedagogical propositions […]. Among these topics one finds: […] environmental education. (BRASIL, 2018).

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Or even in resolution 02 of 2017 of the CNE, which institutes and guides the implementation of the National Common Curricular Base, it deals in paragraph 1 of Article 8:

> Curricula should include a transversal and integrative approach to topics required by specific legislation and standards, and contemporary issues relevant to the development of citizenship, which affect human life on a local, regional and global scale, observing the obligation of topics such as [...] environmental education [...]. (CNE, 2017) *(Free translation).*

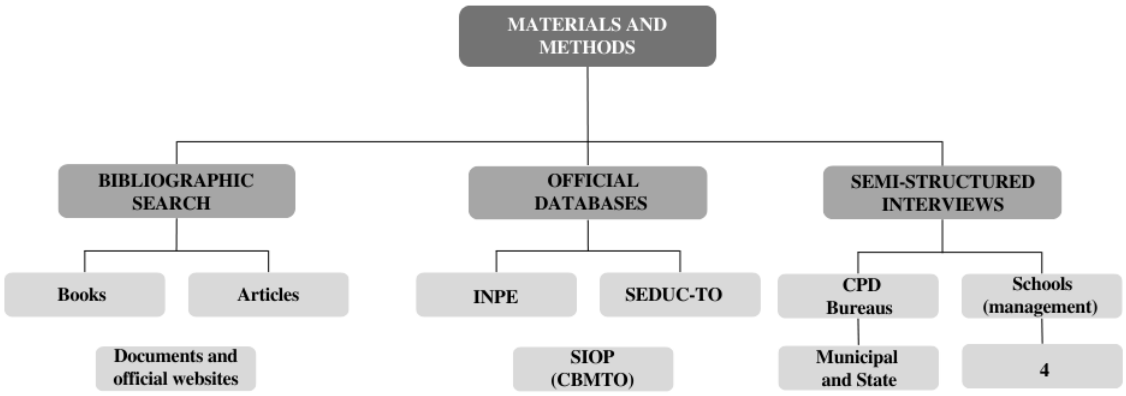
On the other hand, there is huge demand by education systems, teachers, students and external communities for Environmental Education in formal teaching processes, given the need of coping with complex local, regional and global environmental challenges.

All these elements reinforce and acknowledge the transforming and emancipatory role of Environmental Education in school and society. The Public Power accounts for promoting such an education process at teaching level, as provided on the 1988 Federal Constitution, in its art. 225 § 1, item VI: "promoting environmental education at all teaching levels and public awareness focused on preserving the environment" (BRASIL, 2012. p.01).

3. MATERIALS AND METHODS

The present study followed a strategy based on three stages: (a) bibliographic search, based on reading books, scientific articles, digital files and documents from official websites; (b) research in databases by the National Institute of Spatial Research (IMPE) and by Tocantins State Department of Education (SEDUC/TO); and (c) semi-structured interviews. The methodological structure is shown in Figure 1, below.

Figure 1 – Flowchart of the study's methodological path



Source: Elaborated by the authors

The first stage aimed at a literatire review to theoretically reference the assessed topic. It has to gather information about forest burns and wildfire issues, as well as about actions focused on environmental education as measure to reduce these events' occurrence and to minimize their impact.

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The second research stage was set to cross data about heat outbreaks in Palmas County and to locate schools in this city. Data about heat outbreaks were collected in databases available in the website of the National Institute of Spatial Research (BDQUEIMADAS/INPE). Yearly records between 2019 and 2021 were selected and observed in satellite images, in this platform. Searches were also carried out in the Integrated System of Operations (IOS), because this bureau gets all the requests for assistance with forest burns and wildfire events in Tocantins and in Palmas, registers their place of occurrence and those that were assisted by Tocantins Military Fire Department, also known as CBMTO, from 2019 to 2021. School addresses were collected in the database of the State Department of Education (SEDUC-TO).

After gathering data from the first and the second stages, four schools were selected through random sampling, based on the following criteria: belonging to the public municipal or state education network and being located in the capital's Northern and Southern regions, where one finds the highest frequency of heat outbreaks. CPD bureaus and schools were visited for semi-structured interview purposes, as described in Chart 1.

Chart 1 – CPD bureaus and visited schools (semi-structured interviews)

Interviewee			**Institution/school name**
Institutions	CDP 1	Manager (1)	State Coordination of Civil Protection and Defense - TO
	CDP 2	manager (1)	Municipal Coordination of Civil Protection and Defense - Palmas
Schools	School 1	Coordinator (1)	São José State School (Southern Master Plan)
	School 2	Coordinator (1)	Vale do Sol State School (Southern Region) - 500 students
	School 3	Coordinator (1)	Vila União Civil-Military State School (Northern Master Plan) - 387 students
	School 4	School Principal (1)	Monsenhor Pedro Pereira Piagem Municipal School (Northern Master Plan) - 600 students

Source: Elaborated by the authors

The third stage aimed at semi-structured interviews carried out with municipal and state civil protection and defense bureau (CPD) members, as well as with managers (school principals and pedagogical coordinators) in the selected schools, to gather information about issues regarding forest burns and wildfire events in Palmas County, and about actions developed by teaching units focused on preventing and mitigating them. This stage was divided into two moments: one with municipal and state Civil Protection and Defense managers (Palmas and Tocantins) and another moment with managers (school principal and pedagogical coordinators) of schools joining the research. Semi-structured interview was the herein used instrument; it comprised eight questions to guide the burns and wildfire topics in Palmas, issues deriving from these events, actions developed by schools and institutions, from the Civil Protection and Defense (CPD) and environmental education (EE) viewpoint, to reduce their frequency and to minimize their impact; to assess instruments, plans, projects and other

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mechanisms to reinforce this topic in school environment. Interviews happened through one-on-one conversations that were recorded, based on interviewees' previous consent.

After all interviews were over, it was possible elaborating a matrix (CPD bureaus and schools x Guiding questions) for data compilation purposes. It allowed assessing matches and divergences between interviewees about the forest burns and wildfire events issue in Palmas, as well as indicating actions' alignment, the need of adjustments, contributions and suggestions to enhance what was already in place, need of innovations, of reinforcing other aspects regarding the best understanding of a sensitive, complex and dynamic topic.

4. RESULTS AND DISCUSSION

4.1 Distribution of fire outbreaks in Palmas County – Tocantins State

Based on data by Integrated Operation System (IOS), the assisted occurrences were distributed on a monthly basis and stratified into 06 categories (altered area, environmental preservation area, native area, vacant lot and state park). It is possible observing the concentration of activities focused on fighting forest burns and wildfire events in Palmas between June and October, when 96.3% of these events are mainly recorded, mainly in July, August and September (79.3%) (Table 1). This time meets the dry season in this region, when there is significant reduction in rainfall rates.

Table 1 – Occurrences of forest burns and wildfire events in Palmas – assisted by CBMTO (2019, 2020 and 2021)

OCCURRENCES OF FOREST BURNS/WILDFIRES IN PALMAS, ASSISTED BY CBMTO (2019, 2020 AND 2021)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	IDEC	TOTAL
2019			3		9	48	72	109	115	15	1		372
2020	1			2	9	48	134	127	140	47	4	3	515
2021	1	1	1	2	7	46	62	122	73	9			324
TOTAL, ON A MONTHLY BASIS	2	1	4	4	**25**	**142**	**268**	**358**	**328**	**71**	5	3	1,211

Source: Elaborated by the authors based on information provided by CBMTO (2019, 2020 and 2021)

In total, 2,815 heat outbreaks were detected in 2019; 3,051 in 2020; and 1,192, in 2021. The total number of heat outbreaks detected for the herein assessed period-of-time was 7,058. Part of these events were close to Palmas' urban zone, mainly to those on the border of the Master Plan, close to schools, hospitals and residences (INPE 2022) (Figure 2).

Figure 2 – Map of heat outbreaks in the urban zone and in its surroundings, in Palmas County, between 2019 and 2021

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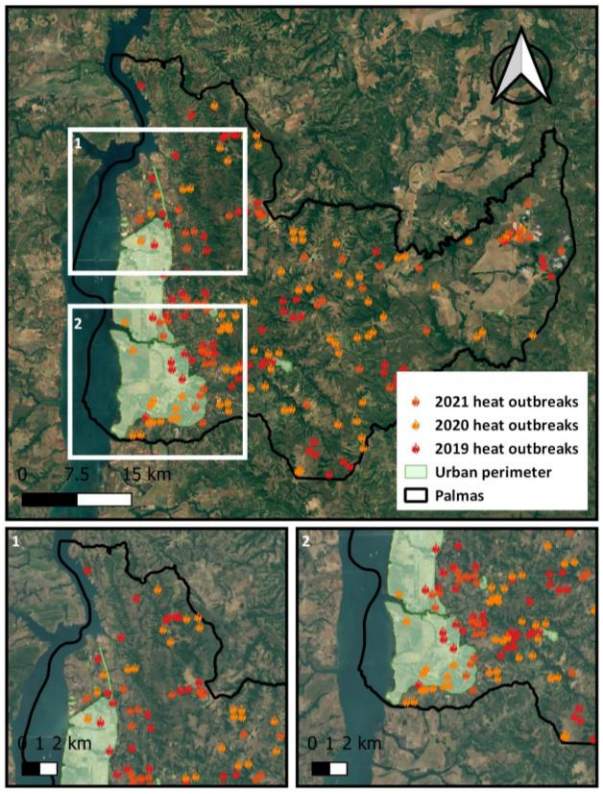

Source: Elaborated by the authors (2022) based on data provided by BDQUEIMADAS – INPE

4.2 Legislation about Civil Protection and Defense, and Environmental Education, in Palmas

The National Policy of Civil Protection and Defense, also known as PNPDEC, provides on law n. 12.608/2012, about the need of integrating Civil Protection and Defense actions to the other policies (territorial ordering, urban development, health, environment, climate changes, water resources management, geology, infrastructure, education, sciences and technology). Risks management is basically split into two big axes, based on actions focused on Prevention, Mitigation and Preparation; and on Disaster Management linked to Response and Recovery actions – Education policy, from the Civil Protection and Defense viewpoint, must synergistically join environmental education. This synergy allows determining strategies to effectively reach disaster/risk reduction (forest burns and wildfire events) and to minimize their impacts, with emphasis on school environment.

There is a management structure in Tocantins State focused on forest burns/wildfire events' issues; it was enacted by Decree n. 645, from August 20th, 1998, which was changed by Decree n. 3.143, from September 17th, 2007. The State Committee of Forest Burns and Wildfire Control, Prevention and Combat comprises more than 30 institutions. Among them, one finds State Coordination of Civil Protection and Defense (CEPDEC), Military Police (PMTO), Military Fire Department (CBMTO), Tocantins Nature Institute (NATURATINS), Tocantins Rural Development Institute (RURALTINS), PREVFOGO/IBAMA, Public Ministry of Tocantins (MPTO), Agricultural Defense Agency (ADAPEC-TO), Agricultural Federation of Tocantins State (FETAET), Agriculture and Livestock Federation of Tocantins State (FAET), Department of Roads and

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Highways (DER-TO), Civil Police (PCTO), Palmas Metropolitan Guard, State Department of Health, State Department of Agriculture and State Department of Education.

The inter-institutional Committee is in charge of elaborating the Yearly Action Plan (TOCANTINS, 2021; 2022) that comprises all Forest Burns and Wildfire Prevention and Combat actions. The 2022 version of this document describes the actions that must be put in place.

The Fire Committee Action Plan (TOCANTINS, 2022) has some strategic actions that can be split into two axes that, in their turn, are divided into stages and actions (Chart 2). The two big axes are Risk Management (prevention, mitigation and preparation) and Disaster Management (responses). The herein assessed topic in Tocantins State, based on the analysis of actions in the plan, stood out for action n.3, in the Risk Management axis. This action comprises "*Promoting content in the regular teaching discipline matrix of Tocantins State by addressing the forest wildfire and illegal burns topic*" (TOCANTINS, 2022, p.2).

Chart 2 – Summary of the Fire Committee Action Plan (2022)

AXIS – RISKS MANAGEMENT
1st STAGE – Prevention, Mitigation and Preparation
Actions: 1 – Promoting advertisement campaigns and forest wildfire prevention and education actions, as well as controlling illegal burns. 2 – Making awareness visits and orienting farmers. 3 – Promoting content of the regular teaching discipline matrix in Tocantins State, by addressing the "forest wildfires and illegal burns" topic. 4 – Gathering and mobilizing Tocantins counties through COMPDEC to attend courses for fire brigade formation. 5 – Form and qualify Fire Brigade members in the whole Tocantins State. 6 – Cleaning priority areas. 7 – Acting in protected areas in Tocantins State. 8 – Monitoring illegal burns and forest wildfires in Tocantins. 9 – Developing Integrated Fire Management (IFM). 10 – Hiring brigades for actins focused on preventing and controlling forest wildfire in Tocantins
AXIS – DISASTER MANAGEMENT
2nd STAGE - Response
Actions: 11 – Validating heat-outbreak information, updating the tabulation of prescribed and authorized burns based on satellite data. 12 – Fighting forest wildfire. 13 – Performing operation and inspection activities. 14 – Presenting data, statistics and reports to the committee.

Source: Tocantins (2022)

This action points towards the straight association between the need of preventing forest burns/wildfire and Environmental Education in school environment. It is important reinforcing the relevance of discussions carried out in teaching units to outspread knowledge about the need of reducing forest burns and wildfire occurrence risks and to contribute to minimize their impacts on Palmas County population by promoting the content in the teaching discipline matrix about this topic. The Action Plan defines who will be accountable for

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performing each of these actions and for developing actions focused on preventing, mitigating, preparing and responding to forest burns and wildfire events (Chart 3).

Chart 3 – Matrix of action accountability at Fire Committee scope

Action 03:	Promoting the content in the regular teaching discipline matrix in Tocantins State by addressing the "forest wildfire and illegal burns" topic.		
Objective:	Awakening in elementary and high school students the relevance and need of working the forest wildfire topic within the environmental preservation context.		
Target Public:	Students enrolled in the state regular teaching network and, by association, the municipal networks		
Activity description		**Accountability**	**Deadline**
Elaborating and distributing Class Plans		SEDUC	School year

Source: Tocantins (2022)

Environmental education actions to be taken at Fire Committee Action Plan scope include their aim, target public, activity description, accountability and deadline. Based on provisions in the legislation and on teaching units' context, this action must be added to discipline contents, according to discipline matrix practices and classroom routines. This action is taken by SEDUC (State Department of Education) and it was called "classroom block", which is a project focused on developing several teaching modules for environmental education to make students aware of problems caused by forest burns and wildfire events (TOCANTINS, 2021a). This project comprises 12 classroom plans and 12 didactic materials, besides focusing on autonomous learning, to meet those addressed in the National Common Discipline Matrix Basis, also known as BNCC, and in Tocantins Discipline Matrix Document (DCT). This project also highlights the importance of students, teachers and school community's effective participation in this action's development (TOCANTINS, 2021a). This project reached - in total - 3,800 students in Palmas County, in 2021 (TOCANTINS, 2021a). The project broadened its reach to other counties (Araguaína, Araguatins, Arraias, Colinas, Dianópolis, Guaraí, Gurupi, Miracema, Paraíso, Pedro Afonso, Porto Nacional and Tocantinópolis) after the cooperation agreement was signed.

Overall, actions developed in the two axes (Risks Management and Disaster management) can be taken by one institution or by a group of institutions, depending on its complexity, range and reach. These actions' execution deadlines during the plans' enactment time (current year) follows a schedule that can be put in place before, during and after the most critical time of the year (May and October) for forest burns and wildfire events in Tocantins State. At the end of the activities, the Fire Committee issues a final report comprising the results and the general evaluation of the plan's conduction to consolidate the actions developed by it, over the year (TOCANTINS, 2021b). The 2022 report is not complete yet, because the action plan is not enforced, so far.

Palmas City Hall created the Municipal Committee for Forest and Urban Wildfire Prevention, Control and Combat at Palmas County scope (Palmas Previncendios Committee), which was enacted by Decree n. 1.901, from June 03rd, 2020. The committee has the main aim

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of elaborating the Forest and Urban Wildfire Prevention, Control and Combat in Palmas County. Among bureaus participating in this action, one finds COMPDEC (Palmas Municipal Protection and Civil Defense Coordination), the Municipal Department of Education, the Municipal Department of Health, the Metropolitan Guard and the Municipal Environmental Foundation.

COMPDEC, along with the Municipal Department of Education, develops actions focused on preventing and responding to forest burns and wildfire events, in school environment. These two bureaus work together in a whole set of actions, based on School environment, aimed at reducing these events' risks, as well as on mitigating their impacts. One of the actions developed in schools belonging to Palmas municipal teaching networks lies on lectures about forest burns and wildfire events to be carried out in 05 teaching units (PALMAS, 2022). Based on the execution schedule, lectures must take place in September and October, and reach 569 elementary school students (PALMAS, 2022).

Another similar action results from the partnership among COMDEC, Palmas Municipal Department of Education and Palmas Municipal Environment Foundation. It also comprises lectures about the forest burns and wildfire issue. According to the schedule of lectures in schools belonging to the teaching network, these lectures were conducted in 06 teaching units and they reached 651 students enrolled in the municipal network.

4.3 Interview analyses

The matrix was structured based on responses, on questions guiding the interviews, on comments and on explanations by interviewees. This format allowed a comparative analysis of contents extracted from the interviews, of convergences, divergences, similarities and managers' positions (CPD and school) about forest burns and wildfire issues in Palmas.

Based on contents collected from the applied interviews, either in municipal or state Civil Protection and Defense bureaus, or in schools, it was possible assessing the understanding and acknowledgement (CPD and schools) that forest burns and wildfire events significantly affect the overall Palmas' population. This agreement shows convergence in the sense of severity featuring forest burns and wildfire events in Palmas. Among the main problems listed by this bureau, one finds those related to the large amount of pollutants and particulates, and of substances dangerous for human health, due to smoke emission.

As reported during the interviews, burns break the normal routines in school environment, in these units. Students and servants complain with breathing issues, and, oftentimes, it leads to absence from school activities, as well as affects their performance and the teaching-learning process.

The State Coordination of Civil Protection and Defense was worried with outspreading the understanding about this issue to other institutions and bureaus. It observed the need of understanding that these events are not on the hands of Tocantins Military Fire Department or of municipal and state Civil Protection and Defense bureaus, and of environmental bureaus, but that they must be fought by a group of institutions, based on multi-disciplinary and cooperative approaches that demand joint efforts to reduce the risk of new events and to minimize their impacts.

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The analysis of interviews' results allowed observing that planned activities must be integrated and coordinated; they must have defined goals, participatory planning and decentralized conduction. Yet, about assessing the gathered information, it was clear that the municipal and state spheres have mechanisms created to promote these actions' integration to a multi-disciplinary profile. The Fire Committee, at both action levels (municipal and state), promotes coordinated activities to reduce risks and minimize these events' impacts.

The need of integration/involvement in connected multi-disciplinary actions, and of showing their interface, is clear if one observes the speech of one interviewee, which is transcribed below.

> […] as there is a committee at municipal level, at state level, there is also a committee to reinforce this interface […], i.e., there was a change in institutional behavior, since there was the understanding that fire, its combat, the preventive actions, were a monopoly by CBMTO and by the civil defense. After the creation of the fire committee, each one has a member in this process' management, regardless of the prevention or combat phase (Manager 1, 2022).

Another identified aspect, from the didactic-pedagogical (content approach format), organizational and documental (how to produce an event, report elaboration, among others) viewpoint, there are differences in each teaching unit. A unit presented these processes in a more organized way, and it produced documents that have allowed recording its actions, whereas other units did not adopt these formal procedures. It does not mean lack of education practices focused on connecting forest burns/wildfire to environmental education in school environment.

Examples of this connection are activities developed in school environment, focused on absorbing knowledge and on learning with lectures, on promoting events like science fairs (which approach the "forest burns and wildfire" topic), and on setting partnerships with non-governmental organizations (that perform practices focused on environmental activities, garbage recycling and nature preservation) and with funding agencies (that sponsor projects aimed at this topic in school environment).

São José High School offered in 2022 the optional discipline "Environmental Education and Burns in Tocantins", with 15-h classroom load. The activity comprised high school 1st and 2nd grade students and approached topics, such as heat and temperature (Physics), human activity interference with the cycle of essential elements (Biology) and environmental impacts (Geography), in a multi-disciplinary way. Videos about the topic were shown during classes, as well as discussions and textual production about burns were carried out, and about environment and sustainability. The lecture about forest wildfire was carried out in partnership with the Fire Department.

Forest burns and wildfire risks management activities in Palmas County were connected to Environmental Education, and they followed the schedules previously elaborated by the institutions belonging to the committee, whose activities present educational interface (CEPDEC/TO, COMPDEC/Palmas, NATURATINS, FMA, SEDUC and Palmas Municipal Department of Education), based on the teaching-learning aims of contents related to the herein addressed topic. Contents were developed based on the legislation (PNPDEC, LDB and

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BNCC), and substantiated by DCT and by other guiding documents to be used as the very basis for these activities' conduction.

Preventive actions involving school community, society and public management can potentiate mid- and long-term results. They contribute to reduce forest wildfire and its consequences to the environment and to human health.

5. FINAL CONSIDERATIONS

The aims of the present study were to investigate forest burns and wildfire events in Palmas County, Tocantins State, and to collaborate to Environmental Education focused on mitigating associated socio-environmental risks and impacts. Palmas territory is 80% covered with vegetation, and it broadens its vulnerability to these events. Occurrences assisted by the Fire Department during the herein assessed years totaled 1,211 occurrences, and 79% of them were recorded among July, August and September, during the dry season. Results recorded from heat outbreak images showed that these events happened all over Palmas.

Results recorded from interviews with representatives from Civil Protection and Defense bureaus and schools have shown their understanding that forest burns and wildfire events are a chronic issue that has significant impact on Palmas' population. The school community reported health issues, school absences and school activity canceling because of them. Civil Defense servants make hard efforts to make the population and institutions understand that these events are not only on the hands of authorities, but on the hands of the collectivity.

There are several mechanisms adopted by the civil defense and/or by schools focused on preventive aspects linked to coping with this issue, such as schedule of lectures or awareness actions. São José School showed Environmental Education, in formal education, namely: it offered an optional discipline called "Environmental Education and Burns in Tocantins" to high school students. It was featured by 15-h classroom load and pointed out this isolated discipline-matrix action.

Municipal and State Civil Protection and Defense institutions support their integrated and multi-disciplinary planning. Committees created for forest burns and wildfire prevention and coping are instruments to reinforce this integrating profile, since they aim at joining efforts and sharing tasks.

There is the understanding that this issue is not only on the hands of an institution, because the actions are diversified, but they have the same goal: reducing the number of these events and minimizing their impacts. From the school viewpoint, connections between CPD and Environmental Education, based on discipline matrix activities in the classroom, on institutional partnerships, on management leading roles, on teachers and students' efforts towards prevention actions, were a reality. Each school has its peculiarities, organization skills and commitment and follows its duties, as provided on BNCC and DCT.

The present study pointed out that Risks Management, based on prevention, mitigation and preparation aspects, takes place in connection to, and evidences, an interface with Environmental Education aspects, in school environment, although it remains incipient and at quite diverse action levels in schools – thus, it can lead to different outcomes. This

inequality results from the capacity of each manager to act, some of them are more sensitive to this topic, whereas others were less sensitive to it. However, they can reach positive results, because, at some extent, institutional and school actions about the herein addressed topic in Palmas County, Tocantins State, help reducing these events' risks and minimizing their impacts.

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APPENDIX - Matrix of results of interviews with managers (cdp and schools)

SCRIPT (Guiding Questions)	ÓRGÃOS E ESCOLAS					
	CEPDEC-TO	**COMPDEC-PALMAS**	**SÃO JOSÉ SCHOOL (1106 Sul)**	**VALE DO SOL SCHOOL (Setor Vale do Sol)**	**VILA UNIÃO SCHOOL (307 Norte)**	**MOSENHOR PEDRO PIAGEM SCHOOL (404 Norte)**
1 – Does the area (region) of Palmas suffer from the occurrence of fires and forest fires?	Yes	Yes	Yes	Yes	Yes	Yes
2 – In view of this occurrence, what are the main problems that arise?	- Seasonal issue - Negative effects on the population - Fire Culture - Economic issues - Human action	- Smoke emission - Health problems - Every year the problem repeats	- Smoke emission - Health problems (general population) - Health problems in the school community (students, teachers and staff)	- Too much smoke - The school is close to Taquaruçu, a region where there is a lot of burning - AUG/SEP are the worst months for fires. - Lack of awareness. - People burn even household waste. - Affects health	- Problems with smoke - Absence of students - Absence of servers - Environmental problems - Interference in the school routine (students and staff with respiratory problems). - Students complain of breathing problems	- Too much smoke - Drinking water that is very hot. - Drinking fountains can't chill water. - Absence of students and staff (respiratory problems)
3 – What has the school done, in terms of preventive actions, to minimize these problems?	Integrated actions, lecture schedule	Fire Committee, Concentrated Actions with a Focus on Prevention	Offer of classes on fires (15h)	Integrated and interdisciplinary actions	Activities involving the school with awareness of the problem and adoption of	Holding events, classes

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					preventive measures.	
4 – What actions aimed at environmental education has the agency developed in the school and community environment in the face of such problems?	- Partnership with SEDUC - Classroom Block Project - Developed in schools - Brigade training - Awareness-raising actions	- Institutional partnerships - Educational actions - Awareness-raising actions - Enforcement action	- Development of interdisciplinary activities focused on the theme, according to BNCC and DCT. - Partnerships with public and private institutions	- Lectures. - Integrated activities - Interdisciplinarity (History-Geography-Biology) - Partnership with BASA – Project "VALE PRESERVAR" (2021)	- Lectures on environmental education, fires in the disciplines of geography, history and biology - Holding of a science fair, with scope on the theme of fires.	- EA lectures, involving the theme. - Partnerships for the lectures
5 – In this context, is there an interface between the agency and other institutions?	-Yes - Fire Committee - Established by State Decree	-Yes - Fire Committee - Established by Municipal Decree	- Yes, but in general, you need to demand the actions. - Request for lectures and other activities. - There is some difficulty in service due to the high demand. - But they are significant.	-Yes - Institutional partnerships - Fire Committee	Yes - But it can improve - Requested a lecture from the civil defense and CBMTO, but was not attended due to lack of personnel.	Yes - Actions are connected and take place in the form of partnerships
6 – Which institutions?	- More than 30 Institutions	COMPDEC, Municipal	Civil Defense, Fire Department, IBAMA	Civil Defense, Health, Education, CBMTO	Fire Committee	- Fire Committee - COMPDEC of

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		Department of Health, Education, FMA, Metropolitan Guard, among others	- Partnerships with public and private institutions (ASCAMPA, ECOVIDA and GRANDE FAMILIA)			Palmas
7 – How are the contents of environmental education and civil protection and defense, focused on the problem of burning and forest fires, addressed with the institutions and communities involved?	- Classroom block project with SEDUC	- Lecture schedules in schools. - Developed in partnership with the Municipal Department of Education and FMA	- Insertions in science disciplines. - Interdisciplinary character - Integrated activities	-Lectures - At this time, there is an offer of lectures by the agencies involved in the theme - DCT: Matrix of objectives and knowledge. - Partnership with ECOTERRA Staff	-Lectures - Interdisciplinary activities - Science Fair	- Lectures are offered to the school. - From the schedule of execution of the activities
8 – Is there any instrument (plan, roadmap, programs, strategies, integrated activities/actions, among others) used to guide the actions developed?	- Action Plans - Setting objectives and goals - Integrated activities - Final evaluation - Preparation for the following year	- Action plans - Setting objectives and goals - Integrated activities - Final evaluation - Preparation for the following year	- The school has a planning of activities focused on the theme. - Activity reports - Presents planned and coordinated actions.	- School uses content on fires from SEDUC (FIRE COMMITTEE) to carry out activities with students	- The actions are based on the documents sent by SEDUC's EA team on the subject	- The actions are based on the documents sent by SEDUC's EA team on the subject

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Observations	With the creation of the COMMITTEE, there was greater integration of actions in schools	- With the creation of the COMMITTEE, there was greater integration of actions in schools - The challenge is the lack of manpower (personnel) - Turnover of people in the organ.- Com a renovação, há a necessidade de novo ciclo de capacitação.				

Source: Prepared by the authors (2022).